ELECTRICAL REVIEW

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19 FEBRUARY 1954

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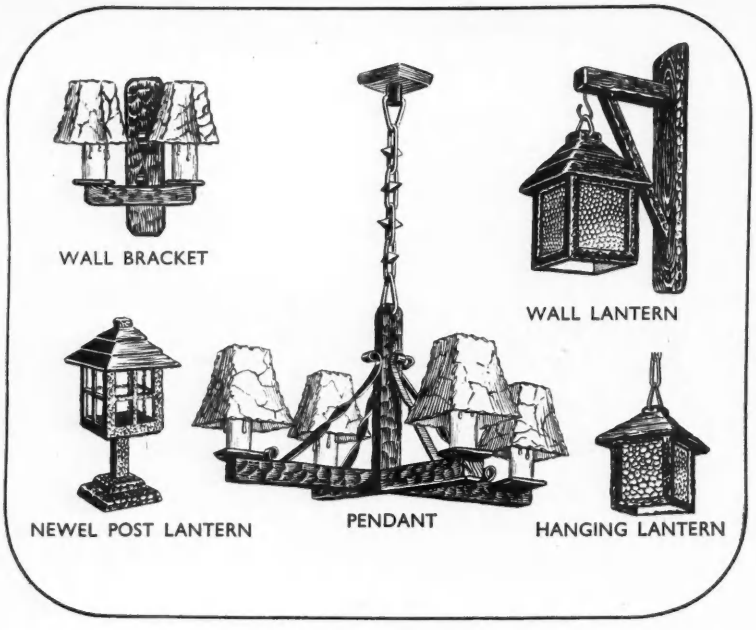
VOLUME 154 ✧ NUMBER 8

Eighty-Second Year of Publication

FRIDAY ✧ ONE SHILLING

Editorial, Advertising and Publishing Offices: Dorset House, Stamford Street, London, S.E.1. Telegraphic Address: "Elecrev, Sedist, London." Code: ABC. Telephone No. Waterloo 3333 (60 lines). Entered as Second Class Matter at the New York, U.S.A., Post Office. Annual Subscription: Home and Overseas £3 6s 0d: U.S.A. and Canada $11.00. Cheques & P.O.s (on Chief Office, London) payable to ELECTRICAL REVIEW PUBLICATIONS LTD., and crossed "Lloyds Bank."



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ELECTRICAL REVIEW

19 February 1954 Vol. 154 No. 8 Established 1872

Aluminium in Cables

ELSEWHERE in this issue we publish a set of tables prepared by the Cable Makers' Association, giving rating factors for various types of aluminium cables, namely, cables with copper conductors and aluminium sheaths, cables with aluminium conductors and lead sheaths, and cables with both aluminium conductors and sheaths, all related to different conditions of service. The use of aluminium for cables was encouraged by wartime raw material shortages, particularly of copper and lead, and later its use was stimulated by the high price of copper. Copper is down to a relatively more economic level once again and it might have been thought that the days of the aluminium-conductor cable were numbered.

Also, apart from price, there are the points that the current-carrying capacities of aluminium are necessarily lower because aluminium has a greater resistivity than copper, while sheath losses with aluminium are greater than in the case of lead because its resistivity is lower than that of lead. Lead is still very costly and scarce, but it is still favoured for cable sheaths, mainly on the score of its greater flexibility and the greater liability of aluminium to chemical attack by various substances. On the other hand considerations in favour of aluminium are its added strength, particularly over lead, and the fact that it is very much lighter than both copper and lead, a point of much importance in the handling of cables.

But our object here is not to make comparisons between any particular classes of materials for cable making and certainly not to suggest that the C.M.A. in any way takes the view that aluminium will oust other materials, especially copper. The fact is that aluminium in cable making has come to stay, at any rate for quite a long time, and that there is therefore a need for some form of authoritative rating tables for aluminium cables. On receiving the new tables it was at first a little difficult to appreciate that aluminium cable ratings did not exist, but so far such ratings have been expressed in such loose terms as, say, certain percentages of the ratings of equivalent copper and lead cables.

We therefore feel that the Cable Makers' Association has afforded a real service to the electrical industry by preparing and issuing the new tables, and we think the Association has been very wise in expressing the new ratings as factors of the actual ratings given in the E.R.A. Report F/T128 for copper-conductor lead-sheathed cables. To publish the tables in factor form is the practical way of handling them. Another important consideration is that this Report is liable to revision in the light of later developments and, indeed, E.R.A. has confirmed to us that it is actually being revised at the present time.

PURCHASE TAX STATEMENT

Both satisfaction and disappointment have been evoked by Mr. Butler's statement on purchase tax last week. Manufacturers and distributors are gratified to have an assurance that there will be no further changes in the tax before or in the Budget. This assurance will do away with the slowing down or suspension of buying which has hitherto preceded Budget Day. At the same time the Chancellor has dashed the hopes of many people for further concessions which they feel to be necessary. The electrical industry must be thankful that some of its products were given favourable attention earlier this year although it shares in the general regret that nothing further is to be done yet to relieve it of this troublesome tax. In this connection it is interesting to have the opinion of the Organization for European Economic Co-operation that last year's reduction in British purchase tax is likely to reduce the incentive to exporters to expand their business, especially as its report refers generally to the beneficial effects of reduced taxation.

ALL-ROUND RISE

Announcements made by a variety of manufacturing and distributing interests clearly foreshadow a general increase in prices as a result of the 10 per cent increase in rail freight charges which is to come into force on 1st March. Immediately concerning the electricity supply industry is the statement by the National Coal Board that the effect upon coal will be to raise the price by from 2s to 4s a ton. The Iron and Steel Corporation estimates that steel production costs will rise by 9s a ton. Export prices will naturally be affected unless home consumers bear the whole load. We suppose that this continued rise in charges is inevitable as the railways are operated at present. The only alternative is a Treasury subsidy, which is most undesirable. Discussions are going on between the British Transport Commission and the railway trade unions to seek ways of raising efficiency, and thus lowering costs, but we are not too hopeful of fruitful results.

PUBLIC ACCOUNTABILITY

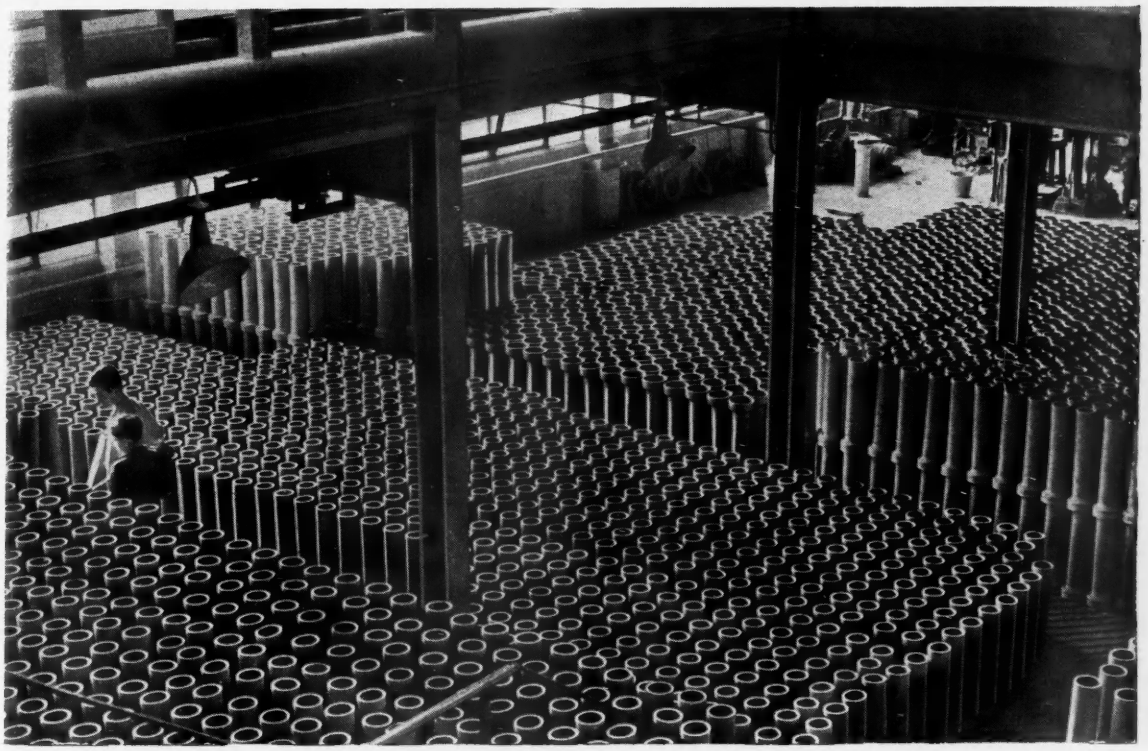
While all industries must ultimately be accountable to the public for their activities, the obligation upon nationalized services to justify their works is more obvious and immediate. In their own fields they are monopolies although, as with gas and electricity, there may be competition in some other form to act as a spur to efficiency. It is an accepted doctrine that bodies which Parliament has created are responsible to Parliament but the degree to which Parliament shall control them or intervene in their operation is an unsolved, or perhaps insoluble, problem. The Select Committee on Nationalized Industries considered that supervision should be exercised by a special Select Committee with sub-committees to deal with specific matters. In the recent Commons debate it appeared that the Government favoured such a committee but with more limited terms of reference than the Select Committee proposed. Whatever action is taken it is imperative that the national boards shall not work under constant fear of inquisition which would engender a caution deadly to enterprise. If the right people are appointed to run the nationalized industries they should be trusted by Parliament whose intervention should be confined to important matters of public policy.

MANAGEMENT QUALIFICATIONS

In this age of specialization each facet of a large industrial organization—design, production, accountancy, sales—tends to become a business in itself and the varied specialist departments can be effectively linked up and controlled only by men of special calibre with a liberal education and minds which operate beyond their immediate surroundings. There are engineers who conform to these requirements but it is generally the case that the engineer's education and training confines him to the purely technical aspects and disqualifies him for management. The subject is one that has been freely discussed in the past few years and attention was given to it again in the paper which Mr. H. Bainbridge read at an A.S.E.E. meeting this week. Mr. Bainbridge rightly implied that the properly-equipped engineer was the ideal manager of an engineering business and he put forward a scheme for the training of young engineers in all departments of a business to enable them to go from shop floor to the higher posts in industry. This training would comprise ten six-month periods, each alternate period being spent in the works. He believed that young men, wisely chosen and trained in this way, would provide the country with industrial leaders second to none.

GETTING NOWHERE

At the time of writing no further attempts have been made to settle the wages dispute in the electrical contracting industry. The Electrical Trades Union is persisting with its area strikes; after London, Liverpool and Manchester, Northern Ireland has been selected for action this week. While the strikes are causing delay and exasperation it is obvious that they are doing nothing to further the Union's case for higher wages. Moreover the exasperation is not confined wholly to the electrical contractors and the public; some of the Union's members are showing signs of restiveness although as yet the feeling is not widespread. The Minister of Labour has apparently made no further endeavour to bring the parties together again. He takes the view, no doubt, that reference of the matter to the Industrial Disputes Tribunal is undesirable while the Union is pursuing its present tactics. Very wisely the employers have not implemented their threat of retaliatory action since the one-day lock-out which followed the one-day general strike in the industry. Their forbearance in this matter has put the responsibility for the continuance of this unfortunate dispute squarely upon the Union.



Stone Pipe Making

Up-to-Date Methods at a Dorset Works

THOUGH they recently celebrated the centenary of their establishment as stone pipe manufacturers, Sharp Jones & Co., Ltd., can by no means be termed old-fashioned in their ideas. Their new Bourne Valley Pottery at Parkstone completed a few years ago and now in full production is run on the most up-to-date lines with new methods constantly being introduced. Wherever possible electricity has been adopted and for this purpose the Southern Electricity Board, Bournemouth Sub-Area, has made available duplicate 500 kVA 400 V three-phase supplies.

The stoneware pipes produced range in inside diameter from 2 to 18in and in length from 3 to 36in. The raw materials are locally excavated clay (two kinds), "grog" (broken rejected pipes or "shards" as they are called) and sand in varying proportions. Incidentally the number of shards is not sufficient to meet the demand for grog and so an extra 20 tons or so of clay has to be fired each week to supplement the supply.

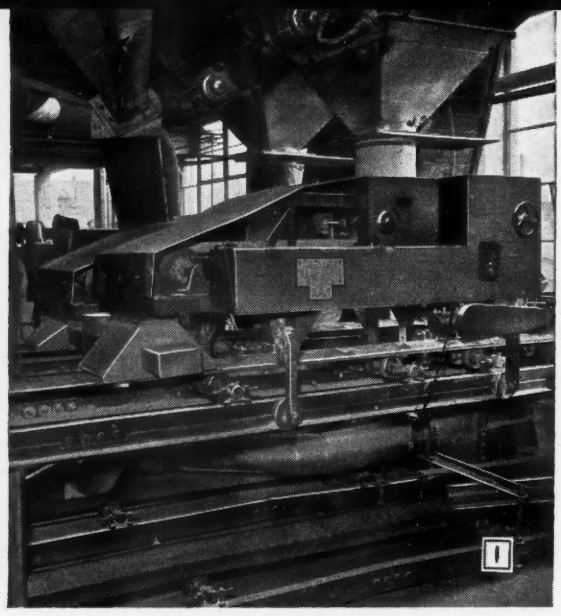
The clay (in a fairly dry state) and the shards are first ground in four Rawdon edge runner pan mills in which pans at the bottom revolve and with the aid of scraper arms force the material between rollers. The two mills for the clay require 50 h.p., and the two for the grog 40 h.p.

Elevators take the ground materials to the floor above where they are passed through rotary screens (3 h.p. motors) to hoppers. From the hoppers, which are electrically vibrated, the clay, grog and sand are each weighed out separately and with extreme accuracy by means of eight electrically operated proportioners and weighers (Adequate Weighers, Ltd.) and are discharged on to a pair of parallel band conveyors. When the material reaches the ends of these it drops on to steel conveyors running underneath in the opposite direction and is collected in a central "boot."

After elevation to the first floor again the rough mix goes first to two dry mixers and then on to wet mixers, finally emerging through pug mills in the form of a continous compressed column, a single 65 h.p. motor driving each group of three machines. A conveyor running along the full length of the works carries the material to the four pipe-making machine bays, ploughs being lowered on to the elevator to direct it wherever required.

Fed into the top of the pipe-making machine, the material is carried by screw conveyor to the vertical part of the apparatus where it is formed, by means of a screw or auger inside a mould, into the required shape. Air bubbles are removed from the material during the pipe-forming process by means of a vacuum system served by a 4 h.p. vacuum pump. Four pipe-making machines are available for producing pipes from 2 to 7in inside diameter and these are driven by 50 h.p. motors. For 8 to 12in pipes there are two machines (60 h.p. each) and for 15 and 18in pipes one machine (75 h.p.). Mechanical fettling and grooving top and bottom to form the keyway for the mortar have been adopted for pipes up to 6in, hand fettling being employed for the larger sizes. Junctions, bends, etc., are still moulded by hand.

Flues containing hot water pipes under the floor provide a gentle warmth for drying, a process which requires



between four and eighteen days according to the size of pipe. The water is heated by a Ruston and Hornsby "Thermax" vertical water tube boiler recently converted from coke to oil firing. The oil, which is stored in tanks having a total capacity of 3,300 gal, is heated by a 4 kW immersion heater and maintained at a temperature of 180 deg F by a "Satchwell" thermostat. It is injected into the boiler at a pressure of 15 lb/sq in with the aid of a 4 h.p. motor which also drives an air pump maintaining the combustion air at 10 lb/sq in. Both the Weir pumps supplying the feed water and the Safran pumps circulating the hot water round the building are automatically controlled, the latter system employing Honeywell Brown motorized valves in conjunction with thermostats.

After drying, the pipes go to the kilns where their temperature is, in four to five days, gradually increased to a maximum of 1,120 deg C, when a small quantity of common salt is introduced into the kiln for glazing. Cooling down then occupies a further three or four days. An innovation is the use of oil for firing the kilns. As in the case of the boiler plant, the oil is electrically heated and the combustion air is supplied at pressure by a pump driven by a 4 h.p. motor; the pumps for injecting the oil into the boiler, however, are separately and individually driven by means of ¾ h.p. motors. Cambridge instruments record the temperature in each kiln every three minutes.

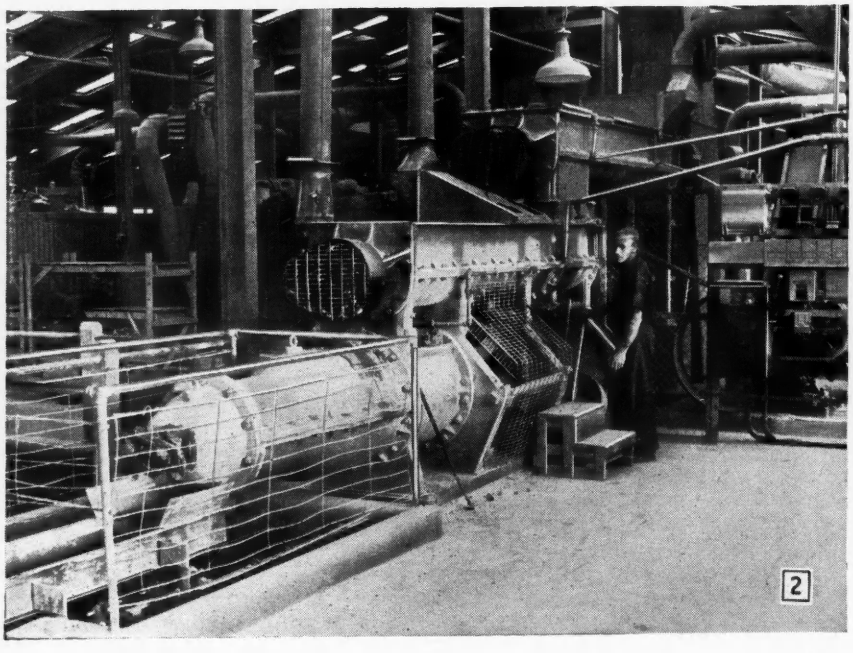
The electrical contractors for the new building were the Southern Electricity Board and the heating contractors were G. N. Haden & Son, Ltd.

Besides making stone pipes the company also claims to be the first manufacturer of concrete pipes in this country. Commencing this side of its business in 1875, the company now produces a complete range of this type of pipe from 6 to 96in internal diameter.

In the department which produces pipes up to 8ft long the Cornish granite, cement and sand used are weighed and elevated to a Liner mixing machine which runs on rails and feeds a row of centrifugal spreading tables. A belt conveyor forming part of the mixing machine assembly is extensible to introduce the mixture inside the mould and deposit it evenly as it revolves. The largest pipes are dealt with on three single-pipe machines, a similar number of machines bonding pairs of medium sized pipes. The smaller pipes are made on two six-pipe units. Each of these centrifugal machines is individually driven by a motor of from 12 to 27 h.p., which in some cases is installed underground. A change-over to variable speed units is proceeding. A Morris hoist is available for lifting moulds.

Separate hand fed centrifugal spreading tables are provided for making 12 and 15ft long pipes. The batch weigher, which is automatically controlled, discharges on to an elevator taking the material to the Liner mixer which in this case is fixed. Another mixer serves a vertical rotary pipe-making machine in which the mould is stationary and a piston revolves. An electric vibrating table assists the consolidation of pipe fittings, etc. The concrete is allowed to mature in the open. Brook motors are employed almost exclusively throughout the works, with Brook or E.A.C. control gear. All the moulds used are made on the premises with the aid of electric welding equipment. Other uses of electricity in the factory include water heating and the drying of clothes.

We thank Mr. P. R. Deck, managing director, and his staff for their assistance in preparing this article.



(1) The clay, grog and sand are weighed out separately and with extreme accuracy by electrically operated proportioners and weighers

(2) Material leaving the pug mill ready for making into pipes

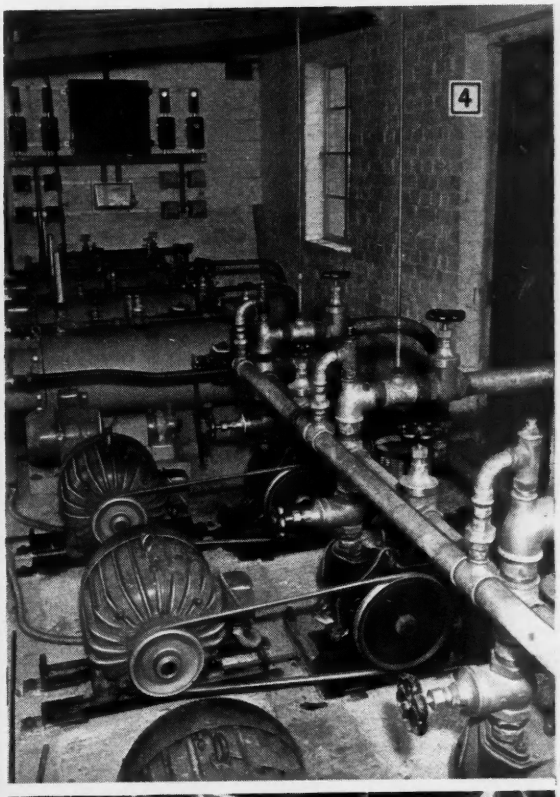
(3) Fed into the top of the pipe-making machine by hand, the material is carried by screw conveyor to the vertical part of the apparatus

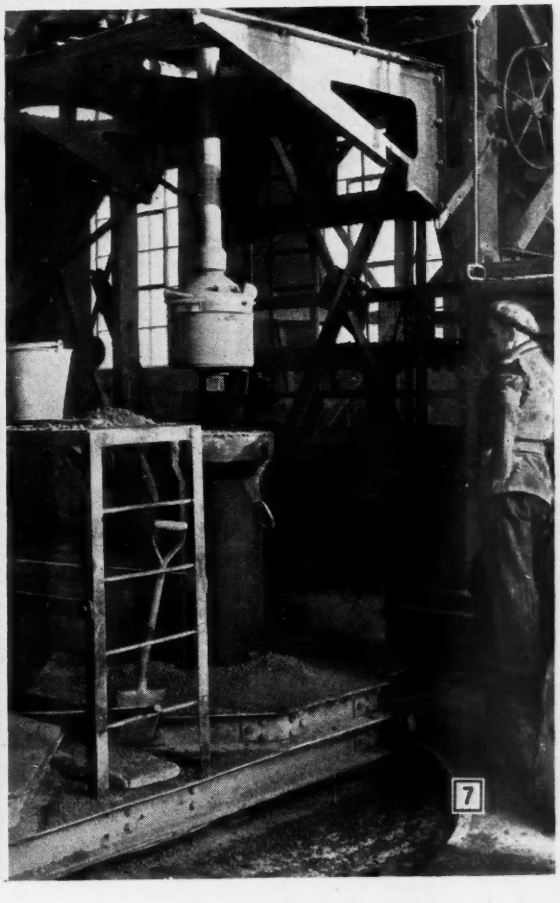
(4) The oil for firing the kilns is electrically heated and pumped by the apparatus in the rear. The combustion air is supplied at pressure by means of the pumps in the foreground

(5) In the background a pipe is seen ready to leave the pipe-making machine for treatment in the mechanical fettling and grooving machine in the foreground

(6) Horizontal centrifugal concrete pipe-making plant, showing mechanical feeder

(7) Vertical concrete pipe mould





NEW BOOKS

Principles of Electricity in M.K.S. Units. By Arthur Morley, D.Sc., Hon. M.I.Mech.E., and Edward Hughes, D.Sc., Ph.D., M.I.E.E. Pp. 364; figs. 227; index. Longmans, Green & Co., Ltd., 6 & 7, Clifford Street, London, W.1. Price 10s 6d.

This is probably the first text-book of electrical engineering science in which the M.K.S. (metre-kilogramme-second) system of units has been used throughout. As indicating the importance of this method of dealing with the subject right from the elementary stage, it may be recalled that after the M.K.S. system in its rationalized form had been unanimously adopted by the International Electrotechnical Commission in 1950, it was recommended in April, 1952, by the Council of the Institution of Electrical Engineers that the system should be employed by authors in papers submitted to the Institution and that all students should become conversant with its use. For the benefit of older students a conversion table is given showing the relationship between the M.K.S. units and the older C.G.S. electro-magnetic and electrostatic units. Further, throughout the book, the symbols and nomenclature adopted are in accordance with the recommendations of the British Standards Institution and the I.E.E.

The joint authors are both widely known for their books on mechanical and electrical engineering respectively and in this volume they have combined to produce a work which covers the syllabus in electrical technology of all the recognized examining bodies up to and including the second year's course. Further to assist the student, particular attention has been given to the working out of examination questions, the text containing a number of worked examples while many of the questions (with numerical answers) at the conclusion of each chapter have been taken from papers set by the examining bodies. This is an extremely useful text-book published at a very reasonable price and it can be recommended with confidence.—A.R.

Television Receiver Design I: I.F. Stages. By A. G. W. Uitjens. Pp. 177; figs. 123; index. Philips Technical Library, Cleaver-Hume Press, Ltd., 42a, South Audley Street, London, W.1. Price 21s.

The first published volume on television receiver design in the series relating to the applications of the electronic valve is a collected and edited version of several papers which were not available outside a limited industrial circle. This cannot be other than of great value to electronic engineers as well as to the advancement of television itself, for as many will admit there is a great shortage of up-to-date information adequately covering the specialized fields which have resulted from the advance of modern technology. This book is indeed complete and it is difficult to see how its contents could be more abreast of present development. In many respects it will not date rapidly as might a less thorough treatise.

The circuit engineer, who will benefit most from a study of this book, will find it a valuable source of reference in that many of his day-to-day problems are crystallized and placed in their proper perspective. The clarity with which such considerations as gain and bandwidth, noise, feedback, etc., are discussed no doubt results in part from Mr. Uitjens' long association with one of the world's foremost valve design laboratories. In this respect it might be hazarded that his book may do a great deal to bring the outlook of valve and circuit engineers together.

Some readers may feel that the section covering the practical aspects could have been somewhat extended but it is doubtful if this criticism has much point in view of the fact that this is one of a series of books. The matter should be reviewed when the complete series has been published. The lack of a full index may cause some delay when referring to a given point. In conclusion this volume can be sincerely recommended to all who have a deep interest in the subject and to designers and students in particular.—D.H.F.

Magnetic Amplifiers. By G. M. Ettinger. Pp. 88; figs. 48; index. Methuen & Co., Ltd., 36, Essex Street, London, W.C.2. Price 6s 6d.

The level of attainment demanded of readers of the Methuen monographs varies rather widely from volume to volume; this is one of the simpler volumes, being easy to understand and almost free from mathematics. This is not intended as a criticism of the book, which is interesting and readable, and fulfils admirably the requirements of a monograph in co-ordinating the most important contributions to the subject. That it is non-mathematical will assist in its being read by experimenters in many branches of science who are not as yet very familiar with the wide range of possible application of the magnetic amplifier.

The author commences with a chapter on the original form of magnetic amplifier—the saturable reactor. Then follow chapters on the various forms of true magnetic amplifier. A useful amount of design data is given, and the various limitations are made clear.

In the final chapter the scope indicated by the title is extended to include the use of saturated core elements in magnetic memory and magnetic switching devices, and the operation of these circuits is discussed.

The properties of various magnetic materials are given in tabular form in an appendix. As the range of properties available with modern magnetic materials is wide and an understanding of them so important it would have been worth while to include a section in which the applications of the different materials discussed throughout the book were collected and discussed.

The book can be recommended to those for whom the author intends it—the engineer and physicist as users of magnetic amplifiers, and the research worker starting in this field.—H.R.L.L.

BOOKS RECEIVED

Low Frequency Amplification. By Dr. N. A. J. Voorhoeve. Pp. 510; figs. 479; index. Philips Technical Library. Cleaver-Hume Press. Price 50s.

Radio Receiver Design, Part I. By K. R. Sturley, Ph.D., M.I.E.E. Second edition. Pp. 667; figs. and index. Chapman & Hall, 37, Essex Street, London, W.C.2. Price 56s.

Magnetic Amplifiers and Saturable Reactors. Edited by M. G. Say, Ph.D., M.Sc., M.I.E.E. Pp. 199; figs. and index. George Newnes, Ltd., Tower House, Southampton Street, London, W.C.2. Price 21s.

Rotating Amplifiers. Edited by M. G. Say, Ph.D., M.Sc., M.I.E.E. Pp. 152; figs. and index. George Newnes, Ltd. Price 17s 6d.

Applied Thermodynamics. By W. Robinson. Third edition. Revised by J. M. Dickson. Pp. 666; figs. 254; index. Sir Isaac Pitman & Sons, Ltd., Parker Street, Kingsway, London, W.C.2. Price 40s.

Fluorescent Lighting

Widening the Colour Field

By A. G. PENNY, F.I.E.S.*

SINCE the hot cathode tube was introduced in 1939 continuous research has been directed to making this highly efficient light source acceptable for installations of every kind. Much of this work has concentrated on colour, and the "Warm White" that followed the "Daylight" tube was the first step towards providing a warmer tone. It was recognized, however, that warmth was not the only factor to consider, and that colour rendering of objects seen by fluorescent lighting should also be looked into, and in later tube colours such as "Natural" and "Mellow" the colour-rendering aspect was emphasized.

The widespread use of fluorescent lighting has caused many people to revise their ideas of what constitutes a satisfactory level of illumination, and this is perhaps best reflected by the ever-increasing number of tungsten filament lamps in installations using these lamps as the only light source. Lighting engineers have, however, remained very conscious of the growing demand for lighting schemes employing both fluorescent tubes and tungsten light sources where they can be combined to make the best use of the high-efficiency characteristics of the fluorescent tube and the small source features of the filament lamp.

Mixed Lighting

Up to the present this use of mixed lighting has been limited by the contrasting colour appearance of the two sources when seen side by side. The problem of producing improved sources is being constantly investigated at the Research Laboratories of the General Electric Co., Ltd., and some of the factors involved in the development of new fluorescent tube colours were discussed in the *Electrical Review* of 6th July, 1951. This article described the work which had been carried out in developing the "Mellow" colour fluorescent tube. Experience has confirmed the conclusions from the laboratory tests that as a warm fluorescent tube source for use as the only means of illumination it is very satisfactory, but difficulties arise when "Mellow" tubes are employed in conjunction with tungsten lamps because of the appreciable difference in colour appearance between the two sources.

As mentioned in the above article, the main problem encountered when very warm fluorescent tube colours are made is the pinkish appearance that is caused by the blue and violet radiation from the mercury discharge itself. In the preliminary work to produce a warm colour to blend well with tungsten, a tube giving a very close match with the "Striplite" type of tungsten lamp was produced by using a double coating, one coating acting as a filter to remove the violet and blue radiation. With this arrangement, however, the average efficiency through life was only 15 to 20 lumens per watt. Subsequent experiments were therefore directed to obtaining the desired result with a single coating produced by blending existing powders, with the dual aim of increasing efficiency and reducing the cost of production which the double coating entailed.

During experiments with the new colour a test bench was made on which coloured materials could be exposed simultaneously to fluorescent and tungsten sources, a vertical screen between the two enabling the resultant renderings to be viewed simultaneously. A gap between the bottom of the screen and the test bench permitted a small area to be seen in the combined light of the two sources.

Colour Rendering

Apart from the colour appearance difference between the existing warm fluorescent tubes and tungsten lamps there is also a very marked difference in the rendering of blue materials. The filament lamp tends to make objects which are blue by daylight turn greenish, whereas a fluorescent tube causes a purplish colour distortion. This purpling of blues is again caused by the blue and violet mercury lines, but it has been found that, apart from selectively absorbing this radiation in a second coating, the effect can be reduced by the addition of sufficient green radiation from the fluorescent tube. This can be extended to produce a greenish distortion very similar to that caused by the filament lamp.

This principle has been carried a stage further in the new "De luxe Warm White" tube, in which the proportion of zinc orthosilicate has been increased considerably. In addition a new halophosphate phosphor has been developed for this particular colour. These two phosphors, together with red fluorescing cadmium borate, mixed in suitable proportions, provide the basis for the new "De luxe Warm White" colour.

The result is a tube with a colour temperature close to that of the average gas-filled tungsten lamp, while the efficiency of the 5ft 80 W size is 28 lumens per watt throughout life.

Laboratory experiments with the new colour were followed by exhaustive comparative tests when observers recorded their impressions of the new tube in a great variety of settings arranged to show its effect in conjunction with different schemes of interior decoration. The tube was demonstrated by itself and in conjunction with tungsten lighting.

More Efficient "Warm White" Tube

Simultaneously with the development of the new lamp the G.E.C. Research Laboratories were working on a new "Warm White" tube. Here again the specification required a good match with most tungsten light sources, but the emphasis has been particularly on light efficiency. In fact, the "New Warm White" colour is the most efficient in the range, giving an average of 52 lumens per watt throughout life in the 5ft 80 W size, an increase of 15·5 per cent over the former "Warm White" tube. The overall photometric performance characteristics of

* Osram Technical Department, General Electric Co., Ltd.

both of these new colours for the 5ft 80 W and 4ft 40 W tubes are given in the following table:—

		E_{AV}
De luxe Warm White	80 W	28
	40 W	30
New Warm White	80 W	52
	40 W	54

In modifying the "Warm White" tube it was again desired to achieve a good match with tungsten lamps. A modified halophosphate has been produced which gives a colour appearance in a tube close to that of a tungsten filament lamp. This phosphor gives some reduction in the blue radiation and an increase in the orange part of the spectrum. These changes are expected to increase still further the popularity of the "Warm White" for general commercial and industrial use, a sphere in which this colour has been more widely used than any other.

The "De luxe Warm White," on the other hand, opens completely new fields for fluorescent lighting. Its very close match with tungsten will make it acceptable to many users who have hitherto hesitated to use fluorescent light sources because they wish to retain decorative tungsten lighting fittings which are an integral feature of the décor of their establishments. Hotels, restaurants, cinema foyers and large stores are a few of the places where the availability of the "De luxe Warm White" tube in all sizes may offer wide scope for new lighting schemes combining efficiency and beauty by the blending of two light sources.

Research in Electrical Engineering

Work of London University and Technical Colleges

THE Regional Advisory Council for Higher Technological Education, London and Home Counties has again this year prepared and issued a summary of the applied research in electrical engineering in progress in university colleges and technical colleges in the region, in the hope of stimulating the undertaking of applied research and assisting in establishing contacts with firms and colleges concerned.

Forty-four examples of the work being carried out at the Imperial College of Science and Technology Department of Electrical Engineering are given and selections from these are: Dielectric properties of ketones and the generation of millimetre waves; the dielectric properties of perovskite structure oxides; ferromagnetic resonance studies in ferrites at centimetre wavelengths; relaxation oscillations in anode drops; photo-electric colour sorting, using electrostatic separation; frequency selective transistor amplifiers; electromagnetic reflection from an interface between free space and an artificial dielectric; and a semi-automatic computer for handling complex numbers in decimal form. Under King's College (Prof. James Grey, M.Sc., Ph.D., M.I.E.E.) four examples are listed, including measurement of losses in ferromagnetic materials at high alternating inductions and the measurement of parasitic losses in alternators.

For Queen Mary College (Prof. W. J. John, B.Sc., D.I.C., M.I.E.E.) twelve items are given of which three are: Theoretical and experimental study of condenser-type bushings; study of arc characteristics; and examination of thermal conditions in, and performance of, cartridge fuses.

For University College (Prof. H. M. Barlow, Ph.D., B.Sc. (Eng.), and Prof. F. Brailsford, Ph.D., B.Sc. (Eng.), M.I.E.E.) there is a list of twelve works which include measurement of losses in ferro-magnetic materials at high flux densities; measurement of power by application of the Hall effect in semi-conductors; measurement of field distribution near the focal point of microwave lens using the spinning dipole technique; and debunching and large signal performance of velocity modulated electron beams.

Other colleges and like institutions and the number of examples given of work on hand are: Acton Technical College (Mr. W. F. Giddings, B.Sc. (Eng.)), two; Battersea Polytechnic (Dr. G. L. d'Ombrain), twelve; Borough Polytechnic (Mr. J. P. Wolfenden, M.Sc.), six; Brighton Technical College (Mr. W. A. Turner, B.Sc. (Eng.)), one; Enfield Technical College (Mr. P. Wicks, B.Sc.), one; Northampton Polytechnic (Dr. P. F. Soper, B.Sc. (Eng.)), five; Norwood Technical College (Mr. G. L. Davidson, M.Sc.), eight; The Polytechnic, Regent Street (Mr. W. H. Date, B.Sc. (Eng.)), seven; S.E. London Technical College, Lewisham (Mr. C. W. Robson, B.Sc. (Eng.)), four; S.W. Essex Technical College, Walthamstow (Mr. H. J. Cooper, B.Sc.), one; Twickenham Technical College (Mr. A. B. Cooper, B.Sc. (Eng.)), one; West Ham College of Technology (Mr. C. T. Baldwin, M.A.), four; and Woolwich Polytechnic (Mr. G. F. Freeman, M.Sc. (Eng.)), four.

Power Factor and Permittivity

THE British Standards Institution has recently published B.S. 2067 : 1953, "Determination of Power Factor and Permittivity of Insulating Materials by the Method of Hartshorn and Ward," which describes in detail the theory and technique of the Hartshorn and Ward method for the determination of power factor and permittivity of insulating materials at radio frequencies.

This method has been adopted as a standard test in certain British Standards for insulating materials, and it is suitable for the measurement of power factor and permittivity within a frequency range of 10 kc/s to 100 Mc/s at normal room temperatures. The method is essentially one of capacitance variation in a tuned circuit with a thermionic voltmeter as a detector of resonance.

Details are given of the technique to be followed in testing moulded and sheet material, tubes and liquids, and drawings are included to illustrate the basic test circuit and some of the basic equipment involved. Appendices describe the theory of the method and detail the essential features of the main components forming the test assembly.

Copies of the standard, price 4s, can be obtained from the B.S.I. Publications Dept., 2, Park Street, London, W.1.

The Faraday Lecture

Electric Heating in Industry

As the subject of this year's Faraday Lecture Mr. O. W. Humphreys (G.E.C. Research Laboratories) chose "Electro-Heat and Prosperity," emphasizing how time, skill and effort had been saved by speeding up heating processes during recent years. The lecture was illustrated throughout by demonstrations and by colour films.

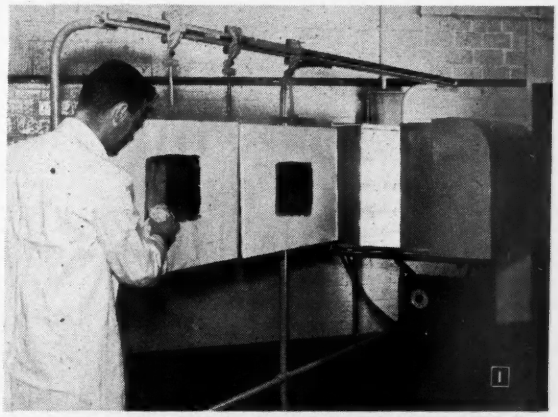
Taking as his first example the making of glass, he showed how electric heating using molten glass as a resistor gave a more uniform temperature throughout the mass. This increased the output from a tank of given size, compared with that obtainable when glass was melted in tanks containing from 50 to 2,000 tons by oil or gas, the flames playing between the surface of the glass and the roof of the tank.

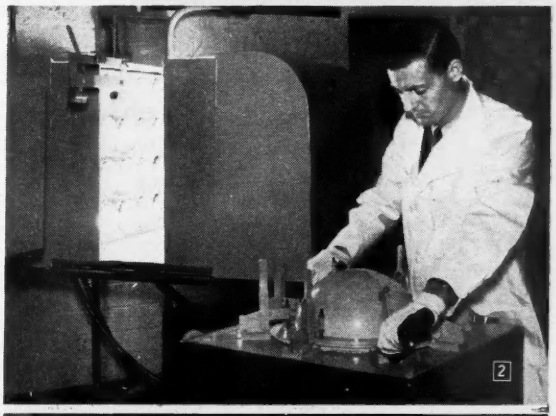
Standard electric lamp bulbs were blown mainly on a new type of machine, of which there were two in this country, capable of producing 1,000 a minute to yield a combined output of 4½ million bulbs a year. These two machines were fed from a single tank delivering 160 tons of glass daily at 1,440 deg C. The blown bulbs then travelled through an oven (often electric), in which they cooled slowly, thus gradually removing stresses in the glass.

For vitreous enamelling, finely ground constituents of glass were suspended in water and sprayed on to the metal before being heated mainly by radiation furnaces to about 800 deg C, which made the glass coating flow and stick to the metal, the operation taking only a few minutes. An example was shown of a 650 kW furnace, 71½ft long, in which the hot zone extended over 40ft of the conveyor track. Its temperature was automatically controlled to suit the parts being treated.

For the melting of high-grade steel alloys, electric arc furnaces ordinarily had capacities of up to 30 tons, but some had been built up to 150 tons. From 450 to 600 kWh per ton was consumed. A typical 30 ton furnace would be supplied at 300 V from an 8,000 kVA transformer. Melting and refining were completed in one to six hours, depending upon the raw materials used.

A major modern development was the use of radiant heating for providing comparatively low temperatures, such as were required for the quick drying of paint, formerly done more slowly in convection ovens. The modern method of securing the requisite concentration of radiation was by means of reflectors formed in the insides of special lamp bulbs. Since the intervening air was not





(1) Exposure for 10 sec to infra-red rays was enough to enable black paint on metal to withstand vigorous rubbing, whereas an unstoved patch of paint could be wiped off easily with a rag. (2) A plastic sheet softened in the same oven as in (1) was clamped in a jig and blown to form the moulding of half a pedestrian road-crossing beacon. (3) By means of high-frequency technique, heat generated in the glue line itself enabled the joints in the ladder shown to be set in 45 sec. (4) With another form of high-frequency heating, electrodes in a valve were raised to red heat without direct heating of the glass bulb

heated, the equipment need not be enclosed to the same extent as in a convection oven.

Radiant heating was also being used extensively for softening plastics to facilitate shaping, since although these were transparent to light they were only partly so to heat. The higher the reflection and transmission factors (as with polished metals), the slower the rate of heating. Black paint absorbed both light and heat, and parts of "Perspex" so treated would become soft sooner than those unpainted, thus enabling their shapes to be manipulated.

Probably the most important use for directed radiant heating lay in the drying of finishes on metal and wood. This was illustrated by black painting two identical sheets of metal. One placed in the oven was quite dry in 10 sec; the other left in the air was still very wet. A method of reconditioning drums was shown. After drying and cleaning, these were sprayed with red and yellow paint and transferred to a drying oven equipped with rod heating elements mounted in reflectors. The oven, 36ft long with a total loading of 288 kW in six sections, individually operated at either half or full heat, could handle 160 drums an hour, only 3 min being required for each.

Another application of radiant heat was the stoving of paint on oil-filled capacitors as used with fluorescent lamps. An oven 12ft long and loaded at 36 kW had a throughput of 250 capacitors an hour and a drying time of 6 min. This plant also checked the oil-tightness of capacitors by heating them to their maximum normal operating temperatures.

White paint, although a good reflector of light, also absorbed the longer wavelength radiation from sheathed wire elements and differed little in heating rates from black paint. In the manufacture of refrigerator cabinets a high-bake paint was used for priming; this was dried in 7 min, the temperature reaching 250 deg C. (Incidentally this method had speeded the drying of paint on artillery shells very notably.) Two coats of paint were then applied, one on top of the other, without intermediate drying. The final coats were heated to 190 deg C for 8 min by radiation, not directed by reflectors, in a 21ft long oven rated at 127 kW. The doors and cabinets, with their four coats of paint, were dried in a total time of 17½ min.

Refrigerator manufacture also provided an example of the modern tendency to take the tools to the job in the joining of metal parts by spot welding. The procedure was to pass a heavy current through the parts, fusing them together under pressure between the electrodes. This method, however, would not be applicable to refrigerator condensers in which 1,000 joints might have to be made between a copper-coated steel condenser tube and its cooling fins. Joints were made by heating the condenser in a furnace containing no oxygen in its atmosphere. A new welding technique, in which an electric arc was continually surrounded by a screen of argon, fed through the handle of the welding gun, thus preventing oxidation, had greatly enlarged the field for aluminium.

Unlike the foregoing applications, high-frequency heating did not depend on heat transfer. Energy first appeared in the object heated (which must be an electrical conductor, though not necessarily a very good one) which was placed in or near a coil fed with current supplied at half a million to a few million cycles a second. The induced currents initially heated the outer skin of the object, making it hard for resisting wear, while the core retained its ductility for strength.

The same principle was adopted for the removal of air (which would spoil the vacuum) absorbed in the metal electrodes of radio valves after evacuation of the bulbs. Drying the electrodes by heat transfer during pumping would also heat the glass, causing it to collapse. Since glass was an electrical insulator it was not affected by h.f. heating.

Electrical insulators could be treated by another form of h.f. heating. A similar type of h.f. generator was used, but its terminals, instead of being connected to a coil, were connected to two parallel metal plates or rods, between which the material to be heated was placed, thus becoming the dielectric of a capacitor. Heat was generated uniformly throughout the whole mass within a few minutes and not only at the surface.

Examples were given of h.f. soldering and brazing and of localized hardening of steel. The final section of the lecture related to the manufacture of high-grade decorated porcelain. An example of speed was the completion of firing within ten hours by electricity against eighteen days by coal.

ELECTRO-MAGNETIC THEORY

A SHORT modern review of fundamental electro-magnetic theory was given by Mr. P. Hammond (University of Cambridge) on 11th February at the Institution of Electrical Engineers. The author criticized the M.K.S. system with reference to teaching on several grounds and submitted an alternative method which took the inverse-square law of force between magnetic poles or electric charges as its starting points and stressed the symmetry of magnetic and electrical relations.

After discussing the processes of electro-magnetic induction and Faraday's distinction between "magneto-electric" and "volta-electric" effects, he referred to the convenience of separating effects due to the relative motion and the relative acceleration of electric charges. To simplify the mathematics and to preserve the symmetry of the formulæ used, the concept of magnetic flux density, B, could be employed. E.m.f. might then be said to arise from the sum of two causes, which ought to be taught separately: first, a coil linked a flux, and the integral of the flux density B perpendicular to any surface embraced by the coil changed with time; secondly, a coil or part of a coil travelled through a field of flux density B in a direction perpendicular to itself and to the vector B. It followed that the flux-cutting rule should not be taught as a derivative of the flux-threading rule; the vector B should not be described in terms that suggested it had material properties; students should not be taught to ask whether the flux linkages were changing, but whether B was changing with time and whether part of the circuit was traversing the field B; the limitations of the working rules should be impressed upon the student.

In a third section of the paper Maxwell's hypothesis that any change in electric flux density resulted in a magnetic effect (which was exactly parallel to Faraday's laws of electro-magnetic induction) was introduced to complete the linkage between the previous sections; viz., first, the two independent and symmetrical systems of units relating to magnetostatics and electrostatics built up from the inverse-square law and, secondly, Faraday's laws which afforded one link between magnetism and electricity.

European Nuclear Research

Work of the CERN Organization

THE European Council for Nuclear Research (CERN) had its genesis in a resolution adopted by the General Conference of Unesco, which called for the formation and organization of regional research centres and laboratories to promote international collaboration in research. In November, 1951, a group of experts from eight European countries drew up a technical programme and recommended the establishment of a temporary organization. This was considered by a conference held at Geneva under Unesco's auspices in February, 1952, and its acceptance led to the constitution of CERN.

Study groups were formed to consider various aspects of the project. These presented their reports in April, 1953, thus enabling CERN to put forward specific proposals for a laboratory and accelerators, as well as for theoretical work, based on a total expenditure of 120 million Swiss francs during the first seven years. A convention giving CERN permanent status was signed on 1st July, 1953, by Belgium, Denmark, France, the German Federal Republic, Greece, Italy, Norway, the Netherlands, Sweden, Switzerland, the United Kingdom and Yugoslavia.

The accelerator envisaged for CERN is a proton synchrotron, scheduled for completion in seven years at a cost of 55 million Swiss francs. It will be capable of accelerating protons to energies up to about 30,000 MeV by making use of the alternating gradient or strong-focusing principle proposed by Courant, Livingston and Snyder in 1952. Since this project represents a new departure in accelerator design, a careful study of the "new-style" synchrotron had to be initiated and is still in progress.

Proposed Proton Synchrotron

The design of a 30,000 MeV machine with an orbit radius of 100 m and an aperture of 2·5 by 5 cm (n value 3,600) seemed to present very great difficulties. Though all calculations are based for convenience on this design, there appears to be little likelihood of building a synchrotron to this specification, but the prospects for building a strong-focusing machine to a modified design are considered favourable. The design study has not yet progressed far enough either on the theoretical or on the practical side to say how much modification is desirable, but a magnet of several thousand tons, i.e., of three or four times the original linear aperture dimensions and with n reduced by 4, can certainly be contemplated, without making the magnet construction costs out of proportion to the remainder of the apparatus.

The main fundamental problems to be studied are :—1. Effect of azimuthal irregularities when using (*a*) a linear variation of magnetic field with radius, and (*b*) a non-linear variation. 2. The use of the beam and of standard surveying methods for lining up the machine. 3. The maintenance of the beam centrally in the "donut" by a frequency and phase control system, particularly at the transition energy. 4. The effect of straight field-free sections and of arrangements of sectors other than simple alternating focusing and defocusing sectors. 5. The value of model experiments.

These problems were singled out for attack as being the most critical ones in determining whether there were fundamental limitations on the construction of a machine using the strong-focusing principle. They have so far been studied in a general way without making any precise engineering assumptions, but the work has reached a stage when engineering figures are required. These will be obtained from measurements and experiments on model magnets, and from other experimental work.

Essentially the 30,000 MeV proton synchrotron will consist of a large number of unit electro-magnets lined up in a circle. The magnet sections are linked together by a continuous circular vacuum chamber in which the protons are made to circulate, guided by the magnetic fields. At points on the circumference radio frequency fields are applied to accelerate the protons until they acquire the wanted energy. The protons are first speeded up in an external linear accelerator and then injected into the synchrotron. Very close mechanical tolerances are required in the manufacture of the magnet sections and in the process of lining them up on the circle. The behaviour of the magnetic fields in time and space must also be known and controlled with extreme precision.

Protection against radiation will be achieved by installing the machine in a circular trench, which will be completely covered by large thicknesses of concrete and earth. This trench will be widened at one side into a laboratory building, which will also contain the equipment for feeding the magnet sections and the linear accelerator injector. For technical reasons, the radio frequency power equipment will be housed in a building in the centre of the circle.

After the injected protons have attained their maximum energy in the synchrotron, they will be made to strike "targets." The type of experiments which will be performed involves the study of nuclear particles ejected or radiation emitted from these targets. The laboratory building will therefore have a clear space on both sides of the synchrotron ring-structure in which the auxiliary experimental equipment can be set up. Both the experimental set-ups and the personnel will have to be protected from the target radiation by heavy concrete barriers.

Strong-Focusing Principle

No definite recommendations regarding the construction of the proposed proton synchrotron can yet be made, but some "pointers" have tentatively been put forward. No fundamental objections to the strong-focusing idea have been found and the prospects of making a strong-focusing synchrotron are good. The most important difficulties discovered in designing a strong-focusing synchrotron are associated with azimuthal inhomogeneities. To reduce these to a reasonable magnitude will require mechanical adjustments, magnetic measurements, beam alignment techniques and field compensating devices developed to a much higher accuracy than those appropriate to a conventional proton synchrotron. If, therefore, too great advantage is taken of the strong-focusing principle the result will be a quite disproportionate effort required to make and set up the magnet to the required accuracy, and a disproportionate "touchiness" in the operation of the machine. From this standpoint, the original magnet, weighing well under 1,000 tons, seems too cheap in cost of materials compared with the difficulties of assembly and manufacture.

As a basis for further consideration, a second design study should assume that n is reduced by 4 (to 900) and that the aperture is increased by 3 or 4 to give a magnet weight of up

to 10,000 tons. The possibilities of constructing such a magnet to the estimated accuracy seem, on the available evidence, good enough to recommend detailed engineering and costing study.

Machines may perhaps be operated with linear fields or maybe with non-linear fields, but the degree of non-linearity must, in either case, be closely controlled, if build-up of oscillations is to be avoided. The machine will need to operate through the transition region and to have the necessary control of frequency and phase by the beam. It would be false economy to consider an injection voltage as low as 4 MeV (van der Graaf). Field inhomogeneities at injection are probably serious enough to warrant an injection voltage of, say, 50 MeV (linear accelerator). This increase will raise considerable difficulties in injection, apart from those of building the linear accelerator.

The synchro-cyclotron will be capable of accelerating protons up to an energy of about 600 MeV and will allow precise measurements on π-mesons and nucleons. It will cost 17 million Swiss francs and will take four years to complete. The design is now so far advanced that, technically, there is no reason why orders should not be placed in the near future.

Large Electro-Magnet

The most conspicuous part of the machine is an electro-magnet with a pole diameter of 5 m. The magnetic field between the poles will amount to an average of 18,000 gauss. The weight of the iron is 2,500 tons and of the two coils together about 180 tons. A stainless steel vacuum chamber placed between the poles of the magnet will contain the electrodes by which the protons are accelerated.

In designing the magnet, extensive model measurements and calculations were made. The iron yoke will be made of high quality magnetic steel (magnetic flux of 2·06 webers per square metre at 300 ampere-turns per cm). The upper and lower yoke parts each consist of 18 plates with a weight of 47 tons per plate. Each of the two vertical yoke parts consists of five plates, each weighing 46 tons. Each pole consists of four pole discs with a weight of about 48 tons per disc. Due attention has been given to high homogeneity of the iron, which is of special importance for the pole tips. Quotations for the manufacture of the magnet, the exciting coils and the vacuum tank have already been received from several firms.

The proton beam extracted from the vacuum chamber will be opposite to the neutron and meson beams. Provision has been made for focusing the proton beam by a bending magnet. The proton beam will enter the proton experimental room through slits in a wall consisting of removable concrete blocks. Also on the neutron-meson side there is a wall of removable blocks, placed very close to the magnet. Mesons are produced at internal targets which may be moved from outside without disturbing the vacuum. For protection, the synchro-cyclotron will be completely surrounded by a thick concrete wall; over the machine will be a concrete roof, and the control room will be 40 m from the centre of the machine.

The accelerated voltage is provided by a high-frequency equipment, which proved particularly difficult to design. The Study Group concerned worked in close co-operation with the Philips works at Eindhoven. After preliminary investigations, it was decided that the modulation of the frequency should be provided by a vibrating reed system.

CERN'S research station will be situated at Geneva and it is hoped that construction can be started this spring and that the laboratory will be fully active in about three years' time.

FIRST ATOMIC FAST REACTOR

WHAT is believed to be the first atomic energy fast reactor (" Zephyr ") to be built in Great Britain has been installed at the Atomic Energy Research Establishment at Harwell, where it was put into operation last week with the object of obtaining operating experience with a fast reactor and information about control systems, nuclear constants and materials and methods of reactor construction which can be obtained only by the actual operation of a reactor. This will be of major importance to the design work on an experimental power-producing fast breeder reactor being undertaken jointly by Harwell and Risley.

The fast reactor has characteristics which make it likely that most of the uranium atoms in natural uranium can be consumed by the process known as breeding. Consequently, if this type of system could be developed a nuclear energy electricity generating system should operate with a much smaller supply of fuel than in the case of natural uranium or slightly enriched uranium thermal fission reactors. The advantages of fast reactors are therefore bound up with the cost and availability of uranium ores.

Reactors previously built and now in use in Britain—two at Harwell and two at Sellafield—use uranium rods enclosed in graphite which acts as a moderator to slow down neutrons produced by fission. Plutonium is created by such piles, and those at Sellafield were built for this purpose, but the principle of breeding is to create more fissile material than is consumed.

The construction of a fast reactor requires pure, or nearly pure, fissile material, so the construction of " Zephyr " could not be undertaken until this material was available. The fuel used is, in fact, plutonium enclosed in a metal can. The core of a fast reactor, i.e., the central portion containing the fuel elements, is very small and in the case of "Zephyr" only about the size of a top hat. The core is surrounded by a more massive envelope or blanket of uranium which either reflects back any neutrons escaping from the core or absorbs them so as to produce fresh plutonium. In this way very few neutrons are wasted.

The designation " zero energy " means that the reactor is to be operated at a very low power level, so that it will not get highly radioactive and will not require cooling. As a result it should be possible to make modifications to the reactor from time to time in the light of experience which had been gained.

The design of " Zephyr," in which special attention has been given to safety, has been the responsibility of the Reactor Physics Division at Harwell, which has had assistance with components from nearly every other Division, especially the Metallurgy and Electronics Division. The detailed design and construction of the reactor was undertaken by the Reactor Engineering Division and the main workshops at Harwell. The safety mechanism was designed and constructed by an outside consultant, Mr. Frazer-Nash, of Kingston-on-Thames.

Further information about the development of " Zephyr " and fast reactors is given in " Britain's Atomic Factories " (H.M. Stationery Office, price 5s), which was reviewed in the *Electrical Review* of 22nd January, 1954.

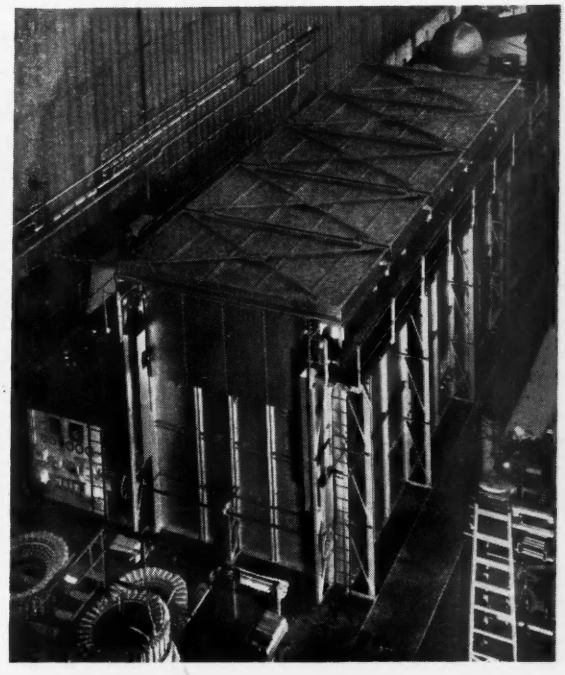
Transformer Drying Oven

New Installation at Loughborough

AN interesting installation for the drying out of large transformers has just been completed by Stordy Engineering, Ltd., at the Loughborough works of the Brush Electrical Engineering Co., Ltd. It comprises an indirectly-heated, air-circulated drying oven incorporating an air dryer, whereby the air in the system, in addition to being continuously recirculated, is also passed through drying towers containing beds of activated alumina as a desiccant.

The desiccant removes moisture from the air and lowers its dew-point, so that its capacity for taking up moisture from the transformer is greatly increased, and the drying out process is accelerated. It has been found in practice that the oven is capable of drying out in thirty-six hours a transformer which would normally require a drying time of two weeks when dealt with in a static drying room, or by other conventional methods.

The internal dimensions of the oven are 18ft deep by 15ft high by 8ft wide, and the transformers are loaded into the drying chamber on a bogie running on tracks laid in the floor. The sliding door is secured by screw-clamps to ensure that it is firmly seated, and forms an air-tight seal. Once the drying out cycle has commenced, the introduction of atmospheric air into the system can be carefully controlled.



The new transformer drying oven at the Brush Works, Loughborough

Drying Cycle

The circulating fan is of the multivane, centrifugal type, and is driven by a squirrel cage motor. After leaving the fan, the air is made to pass through a system of ducting which ensures that it is evenly distributed throughout the working space of the oven. Considerable turbulence is created around the transformers and the air penetrates to the heart of the core and windings, conveying the heat directly to the points at which the greatest concentration of moisture occurs.

Before it returns to the circulating fan, the air passes through a heat interchanger where it is re-heated. The interchanger is gas fired and the products of combustion pass through a battery of tubes before being exhausted to atmosphere. The air from the oven passes over the outsides of the tubes which are gilled to give increased heat transfer.

Automatic temperature control is by a thermostat operating a motorized dual valve controlling the supply of gas and air to the burners. Airflow switches are fitted, which operate in conjunction with a solenoid-operated gas valve arranged to cut off the gas supply in the event of failure of the circulating fan or of the air supply to the burners.

During the preliminary stages of the drying cycle the air drying towers are not used, and a proportion of fresh air is introduced into the system. This displaces a corresponding volume of moisture-laden air, which is vented to atmosphere. This stage is particularly necessary in the case of the drying out of transformers which have previously been immersed in oil, and it is required to eliminate the oil fumes from the system.

After this the fresh air inlet and exhaust outlet connections are closed and sealed. From this point the oven is made air-tight, and atmospheric moisture is excluded.

The air dryer comprises two towers which contain beds of activated alumina, one being used for drying purposes while the other tower is being reactivated. A duplex fan unit draws air simultaneously through both towers, on the one hand circulating air from the oven through the drying tower, and on the other hand drawing heated air over the beds of desiccant in the other tower to reactivate them. This reactivating air is heated by a separate gas-fired air heater with thermostatic temperature control, and after passing through the desiccant is exhausted to atmosphere.

Production Bottleneck Removed

That air which is drawn off from the oven to be dried is first cooled by water tube cooler and then filtered and passed through the drying tower, after which it is returned to the oven circulating system. The dew-point of the dried air is reduced to −40 deg F. Each drying tower is capable of effectively drying the air for about four hours after which an automatic process timer operates the two-way valve to divert the air to the other drying tower, while the "spent" tower becomes available for reactivation. By reducing the time involved in drying out transformers, the oven has removed a production bottleneck. Furthermore, because the moisture is rapidly removed from the transformer and also the oven, the old trouble of rusting of the core due to moisture condensing on the surface during prolonged drying periods is eliminated. Shrinkage of the "Elephantide" spacers is also reduced to the minimum.

ALUMINIUM CABLE RATINGS

THE following tables of rating factors prepared by the Cable Makers' Association will render it easy to ascertain the maximum currents for aluminium type paper-insulated power cables of the following constructions:—

(*a*) Copper conductors with aluminium sheaths, (*b*) aluminium conductors with lead sheaths, and (*c*) aluminium conductors with aluminium sheaths.

These factors are applicable to the normal current ratings established by the Electrical Research Association and published in Report F/T.128, for copper-conductor lead-sheathed cables, and the particular reference concerned is indicated for each table. The conductor strands and insulation thicknesses for cables with aluminium conductors are the same as those for the same sizes and

TABLE 1.—SINGLE CORE CABLES

Current Rating Factors for Cables having Aluminium Conductors and/or Aluminium Sheaths (A.C. Systems Only)

	Copper Conductor Aluminium Sheath			Aluminium Conductor Lead Sheath			Aluminium Conductor Aluminium Sheath		
	Conductor Area sq in	Factor—per cent		Conductor Area sq in	Factor—per cent		Conductor Area sq in	Factor—per cent	
Laid Direct (Served) All Voltages Factors applicable to values given in Cols. 3, 4, 5 and 6, Table 1, E.R.A. Report F/T.128	Up to 0·25 0·30–0·40 0·50 0·60 0·75 1·00	97 94 91 87 84 80		Up to 0·30 0·40–0·50 0·60 0·75 1·00	78 79 80 81 83		Up to 0·15 0·20–0·25 0·30–0·40 0·50 0·60–0·75 1·00	78 77 76 75 73 72	
In Ducts* (Served). All Voltages Except Where Otherwise Stated		Up to 11 kV	22 kV						
Factors applicable to values given in Cols. 4, 5 and 6, Table 7, E.R.A. Report F/T.128	Up to 0·10 0·15–0·20 0·25–0·30 0·40–0·50 0·60–0·75 1·00	120 112 107 101 99 95	115 107 102 101 99 95	Up to 0·15 0·20–0·30 0·40 0·50–0·60 0·75 1·00	78 79 80 81 83 85		Up to 0·15 0·20 0·25–0·30 0·40–1·00	92 89 87 84	
In Air (Served). All Voltages Factors applicable to values given in Cols. 3–9, Table 13, E.R A. Report F/T.128	Up to 0·40 0·50 0·60–0·75 1·00	95 92 87 82		Up to 0·30 0·40–0·50 0·60 0·75 1·00	78 79 80 81 83		Up to 0·10 0·20–0·40 0·50–0·60 0·75 1·00	77 76 75 73 72	
In Air (Sheath Left Bare). All Voltages		Trefoil	Flat		Trefoil	Flat		Trefoil	Flat
Factors applicable to values given in Cols. 3–9, Table 13, E.R.A. Report F/T.128	Up to 0·0225 0·04–0·40 0·50–0·60 0·75–1·00	84 90 86 82	84 90 86 84	Up to 0·30 0·40–0·50 0·60 0·75 1·00	72 75 76 77 80	74 77 78 79 84	Up to 0·10 0·15–0·25 0·30–0·60 0·75–1·00	70 71 72 72	70 71 72 74

* *Maximum conductor temperature for single core aluminium sheathed cables up to 11 kV, 70 deg C; above 11 kV, 65 deg C. Maximum conductor temperature for lead sheathed cables, all voltages, 50 deg C.*

TABLE 2.—MULTICORE CABLES

Current Rating Factors for Cables having Aluminium Conductors and/or Aluminium Sheaths (A.C. Systems Only). Excluding S.L. Types

	Copper Conductor Aluminium Sheath		Aluminium Conductor Lead Sheath		Aluminium Conductor Aluminium Sheath	
	Conductor Area sq in	Factor—per cent	Conductor Area sq in	Factor—per cent	Conductor Area sq in	Factor—per cent
Laid Direct (Served). All Voltages Factors applicable to values given in E.R.A. Report F/T.128 for armoured and served cables	Up to 0·60 0·75 1·00	100 99 98	* Up to 0·20 0·25–0·30 0·40–0·50 0·60 0·75 1·00	* 78 79 80 81 82 85	Up to 0·20 0·25–0·40 0·50–0·60 0·75 1·00	78 79 81 82 85
In Ducts (Served). All Voltages Factors applicable to values given in E.R.A. Report F/T.128 for armoured and served cables	Up to 0·50	100	* Up to 0·20 0·25–0·30 0·40–0·50	* 78 79 80	Up to 0·25 0·30–0·50	78 79
In Air (Served). All Voltages Factors applicable to values given in E.R.A. Report F/T.128 for armoured and served cables	Up to 0·50 0·60–1·00	100 99	* Up to 0·20 0·25–0·30 0·40–0·50 0·60 0·75 1·00	* 78 79 80 81 82 85	Up to 0·10 0·15–0·30 0·40–0·50 0·60 0·75 1·00	78 79 81 81 82 85
In Air (Sheath Left Bare). All Voltages Factors applicable to values given in E.R.A. Report F/T.128 for armoured and served cables	Up to 0·30 0·40–1·00	96 98	Up to 0·20 0·25–0·30 0·40–0·50 0·60 0·75 1·00	75 76 81 83 84 89	— Up to 0·10 0·15–0·30 0·40 0·50 0·60 0·75 1·00	— 75 76 77 78 79 81 84

Factors for conductor sizes above 0·5 sq in apply to L.V. cables only. For unarmoured and served, and bare wire armoured cables the various factors given in E.R.A. Report F/T.128 for these types must also be applied. * *Armoured and served cables.*

types of copper-conductor cables, and the thicknesses of aluminium sheaths are in accordance with current practice and will be included in future British Standards.

It has been assumed that the aluminium-sheathed cables are unarmoured in all cases. The conditions of installation and general assumptions made with respect to the cable ratings are those given in the aforementioned E.R.A. Report. The maximum conductor temperatures for aluminium cables remain the same as those specified in Report F/T.128, with the exception of aluminium-sheathed cables installed in ducts which are allowed the same maximum temperature as armoured lead-sheathed cables in ducts. It should be noted, therefore, that in all cases the same maximum temperatures are permitted with aluminium-sheathed cables as with the equivalent armoured lead-sheathed cables. The increased loss consequent upon the lower resistivity as compared with a lead sheath, however, is responsible for a reduction in rating, particularly with large sized cables. The rating factors in the following tables will not be affected to any appreciable extent by changes in basic ratings of maximum operating temperatures.

TABLE 3.—S.L. TYPE CABLES

Current Rating Factors for Cables having Aluminium Conductors and/or Aluminium Sheaths (A.C. Systems Only)

	Copper Conductor Aluminium Sheath		Aluminium Conductor Lead Sheath		Aluminium Conductor Aluminium Sheath	
	Conductor Area sq in	Factor—per cent	Conductor Area sq in	Factor—per cent	Conductor Area sq in	Factor—per cent
Laid Direct (Armoured and Served) Factors applicable to values given in E.R.A. Report F/T.128 for armoured and served cables	Up to 0·10 0·15–0·20 0·25 0·30 0·40 0·50 0·60	99 97 96 95 93 92 91	Up to 0·25 0·30 0·40 0·50 0·60	78 79 80 81 82	Up to 0·10 0·15–0·40 0·50–0·60	78 77 76
In Ducts (Armoured and Served) Factors applicable to values given in E.R.A. Report F/T.128 for armoured and served cables	Up to 0·10 0·15–0·20 0·25 0·30 0·40 0·50–0·60	98 97 96 95 93 91	Up to 0·25 0·30 0·40 0·50 0·60	78 79 80 81 82	Up to 0·60	77
In Air (Armoured and Served) Factors applicable to values given in E.R.A. Report F/T.128 for armoured and served cables	Up to 0·10 0·15–0·20 0·25–0·30 0·40 0·50 0·60	99 98 97 95 94 93	Up to 0·25 0·30 0·40 0·50–0·60	78 79 80 81	Up to 0·60	77

TABLE 4.—CABLES FOR D.C. SYSTEMS

Current Rating Factors for Cables having Aluminium Conductors and/or Aluminium Sheaths

	Copper Conductor Aluminium Sheath	Aluminium Conductor Lead Sheath	Aluminium Conductor Aluminium Sheath
All sizes and all types and all conditions of installation with the exception of aluminium sheathed cables in ducts Factors (per cent) to be applied to values given in E.R.A. Report F/T.128 for cables having similar finishes	100	78	78
All sizes of aluminium sheathed cables in ducts **Single Core:** Factors to be applied to values given in Col. 2, Table 7, E.R.A. Report F/T.128	97	—	75
Multicore: Factors to be applied to values given in E.R.A. Report F/T.128 for armoured cables	100	—	78

Cable Soldering Sockets

THE 1954 edition of B.S. 91, " Electrical Cable Soldering Sockets," has just been issued and is available at 3s from the British Standards Institution, British Standards House, 2, Park Street, London, W.1. This revision was undertaken when it was found that industry was using two distinct series for tubular lug sockets, and that each was desirable for the purpose for which it was being used. These are the series in accordance with the 1930 edition of the standard and an additional series in accordance with the war emergency revision.

The former series (Tables 1 and 2B) is designed for cables of specified size, irrespective of the type of cable used. The socket, therefore, is made to be capable of carrying the maximum current for which any type of cable of that size is suitable. It is generally for use when the actual current is not known, as in cable junction boxes.

The latter series (Table 2A) is designed for specific currents, where the socket is required to take the largest cable which may be necessary to carry that current, taking into account voltage drop. It should be remembered that the sectional area of the cable is not necessarily determined by the rating of the appliance, e.g., switchgear. This series of sockets is more suitable for use with apparatus having a known current rating.

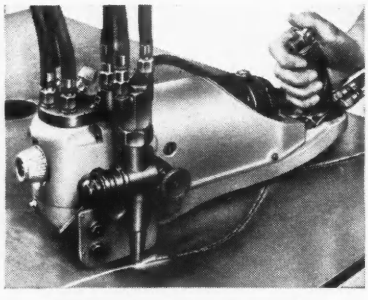
The new standard relates to two main classes of electrical cable soldering sockets for connecting to each other or to apparatus, namely lug sockets and clamp sockets. The lug sockets are classed as hot pressed or cast lug sockets and tubular lug sockets. It specifies material for and dimensions of sockets suitable for cables from 7/·044 to 127/·103 and for currents from 15 to 500 A. Requirements for the hot pressed or cast lug sockets have also been revised to bring them into line with present-day practice, which favours a lighter socket.

NEW ELECTRICAL EQUIPMENT

Metal Cutting Machine

FOR STRAIGHT line and circle cutting the "Bantam" is the latest cutting machine made by the BRITISH OXYGEN Co., Bridgewater House, Cleveland Row, St. James's, London, S.W.1. It is also the lightest, weighing only 22¾ lb including cutter.

With this machine an operator can cut mild steel up to 2in thick and when used in conjunction with the radius bar circles of between 3in and 45in diameter. For bevelled edges the cutting head is adjustable enabling an inclined cut to be made at any angle up to 45 deg. It is also adjustable for lateral movement and height.



"Bantam" metal cutting machine

The cutter uses the "Cutogen" one-piece nozzle which gives clean machine finished cuts on slow curves when free cutting. The castor trailing wheel can be locked for running on a track and disengaged for circle and profiling cutting by the simple adjustment of a locating screw. A 3ft light alloy track is provided with the machine and further lengths can be bought separately for extending it. There is a reversing switch for straight cutting when mounted on the track and to enable the nozzle to be quickly lined up over the work a cross traverse arm is fitted with a quick acting locking lever, a refinement not usually found on a machine of this kind.

Transistors for Experiments

Point-contact and junction-type transistors for experimental purposes are announced by MULLARD, LTD., Century House, Shaftesbury Avenue, London, W.C.2. They are available to electronic equipment designers wishing to investigate the many interesting potentialities of transistors and to carry out practical experiments in transistor circuitry.

The inclusion of junction-type transistors in the range is significant since it now enables circuit designers in this country to gain direct experience of junction transistors in their own laboratories. In the past, this has been prevented by lack of supplies. Transistors at present available include two point-contact types, the OC50 and OC51, and three junction types, the OC10, OC11 and OC12. These five offer designers a wide variety of characteristics.

Portable Industrial Lamps

A new range of robustly constructed portable lamps and electrical equipment for use in industry has been produced by OLDHAM & SON, LTD., Denton, Manchester. Among them the "Tanka 11" has been approved by the Ministry of Fuel and Power for use in mines and meets the requirements of the Ministry of Transport as a Class 1 lamp. Security is achieved by a magnetic lock over the charging contacts and sealed locks on the lens ring and lamp top. The high capacity accumulator together with a 1 A krypton-filled bulb of 46 lumens light output gives a high intensity light for over 8 hours. Two reflectors are available to provide the kind of light distribution required.

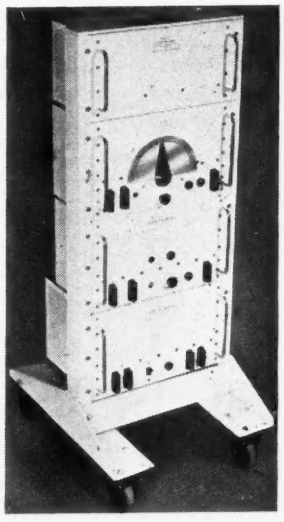
There is also a new shunters' lamp which is approved for use in mines by the Ministry of Fuel and Power. A white light gives general illumination which can be changed to red or green at the flick of a switch. If one filament of a double-filament krypton-filled bulb fails the lamp can be immediately switched over to the other.

Also available are two "Tuba" electric safety torches. Type TD2A has two cells and type TD1A three cells. They both have a protective grill, armoured glass lens, semi-polished reflector, a special shock protector between bulb and battery and a heavy gauge chromium plated brass body.

Another item is a cap lamp for industrial use which has a matt aluminium reflector giving an even distribution of light over a wide angle, but a polished reflector giving a long concentrated beam can be supplied if required. The lamp is certified as safe for use in methane. Special types of cap lamps are also available for use in dangerous atmospheres other than methane.

Stabilized A.C. Supply

For research and certain kinds of manufacturing processes a continuously stable power supply is essential, and



Salford stabilized a.c. supply source

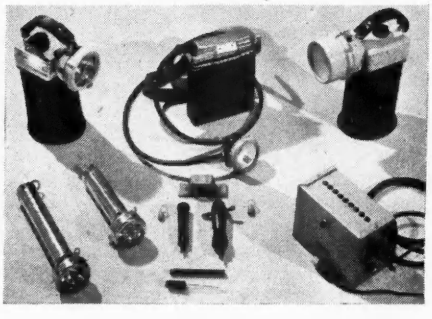
the fluctuations encountered in normal mains supply cannot be accepted. SALFORD ELECTRICAL INSTRUMENTS, LTD., Silk Street, Manchester, has produced an instrument which, despite mains variations from −10 V to +20 V at the input stage, will maintain at the output stage any voltage from 200 V to 250 V within ± 1 V and any frequency from 34 to 66 c/s within ±0·05 c/s.

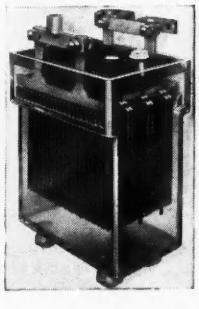
The instrument is mounted on a mobile standard 19in rack and it comprises four units: an oscillator, a 100 W amplifier, the amplifier power unit, and a voltage stabilizer.

Sealed-in Stationary Cells

The range of sealed-in stationary cells produced by CHLORIDE BATTERIES, LTD., Exide Works, Clifton Junction,

Left: Oldham industrial safety lamps. Right: Chloride 450 Ah sealed-in stationary cell





Swinton, Manchester, for emergency lighting and power, switch closing and similar duties in industry, has been augmented by the addition of what is perhaps the largest standard sealed-in cell now available. Designated the GCG10E, it has a capacity of 450 Ah at the 10-hour rate of discharge down to a final voltage of 1·85. It is eminently suitable for operation on all types of circuit whether "floating," trickle charge or straight charge and discharge.

Weatherproof Switchgear

A new range of heavyweight weatherproof switch-fuses for use outdoors and in places where conditions are particularly rigorous has been introduced by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2. These comply with Factory Regulations, I.E.E. Regulations and the relevant British Standards. They are intended for circuits up to 500 V and are available in 20, 30, 60 and 100 A sizes in single pole and neutral, double pole, triple pole and triple pole and neutral types. They are arranged to take rewirable or h.r.c. cartridge fuses, the carriers for each type being interchangeable.

The heavy cast iron cases of the new switchgear range are completely weatherproof; they are undrilled, with external fixing lugs and gasketed cast iron end plates. The end plates, which cover slots in the top and bottom of the boxes, can be removed and drilled for conduit entries.

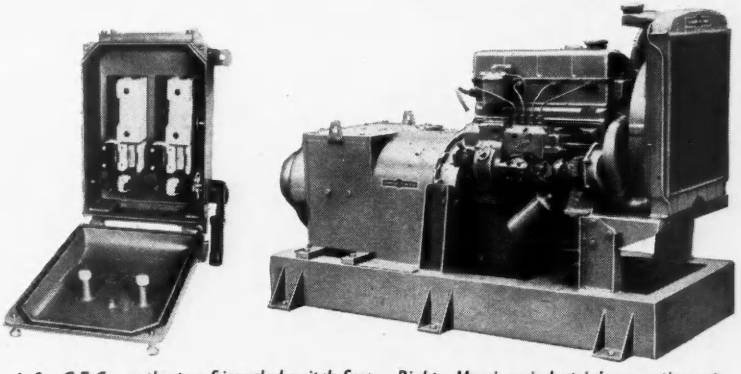
Self-Regulating Alternator

A self-regulating alternator which provides for control of output voltage without an automatic voltage regulator has been developed by CROMPTON PARKINSON, LTD., for use in small generating sets. It is of simple and robust construction and therefore particularly suitable for service where generating sets have to be operated by semi-skilled attendants and maintenance requirements must be a minimum.

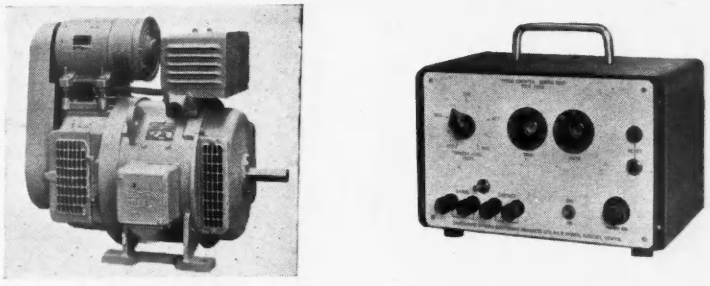
Known as type "FQ," the alternator has an inherent voltage regulation of ± 2½ per cent from full load to no load at any power factor between unity and 0·75 lagging, within standard limits of engine speed governing. It is available for outputs up to 115 kVA, 500 V at 1,500 r.p.m. and 95 kVA, 500 V at 1,000 r.p.m.

Cycle Counter

The cycle counter recently introduced by LANCASHIRE DYNAMO ELECTRONIC PRODUCTS, LTD., B.E.P. Works, Rugeley, Staffs, will be of particular interest to users of resistance welding machines, but it will obviously find ready application in industry generally. Two "Dekatron" tubes are used giving direct counts up to 99 cycles. If it is desired to exceed this figure, visual note can be made of the number of revolutions performed by the "tens" counter, which is not difficult since it resets every two seconds.



Left: G.E.C. weatherproof ironclad switch-fuse. Right: Morrison industrial generating set



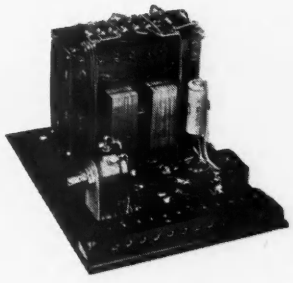
Left: Crompton Parkinson type "FQ" self-regulating alternator. Right: Lancashire Dynamo Electronic Products cycle counter

For use with resistance welding plant the unit can conveniently be connected to the primary of the welding transformer, a potentiometer catering for voltages between 100 and 500. When used with equipment incorporating electronic weld heat control, the counter will operate perfectly satisfactorily in spite of the bad waveform encountered when the ignitrons are fully retarded. Two additional terminals are provided so that the unit will count for as long as a circuit is maintained between them. In this instance the cycles are indicated at the supply frequency. Setting to zero is by means of a reset button and a jack plug enables this to be accomplished remotely if desired. The unit is portable and designed to operate from a 110 or 200–250 V supply.

Educational Magnetic Amplifier

A magnetic amplifier for instructional and laboratory use is now being made by ELECTRO METHODS, LTD., Caxton Way, Stevenage, Herts. It is designed so that its basic principles of working can be easily investigated. All the important measuring points are easily accessible and the circuit can be traced by following the colour coded connections. The supply voltage is 20 V at 50 c/s and there are two independent input windings of 100 ohms each, which may be connected in series or parallel or used independently. The recommended load is 30 ohms into which the output power is 2·7 W, while the power amplification is 40,000 with 100 per cent self-excitation.

Electro Methods educational magnetic amplifier



Industrial Generating Set

The latest industrial generating set to be introduced by A. C. MORRISON (ENGINEERS), LTD., Cliff Works, Burton-on-the-Wolds, Loughborough, has a rating of 25 kVA, three-phase, 50 or 60 c/s and is available for any standard voltage. Compact and portable, it is only 43in high and 71in long.

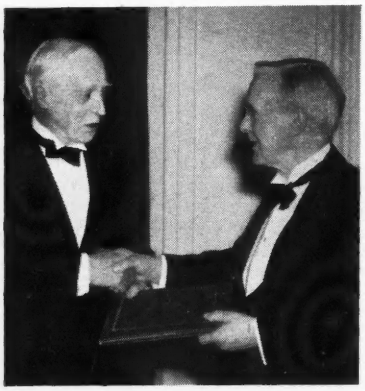
The power unit is a modified industrial version of the Fordson Major diesel tractor engine which has an output of 34 b.h.p. at 1,500 r.p.m. on the 12-hour rating corrected to B.S. 649: 1949. Fuel consumption is economical at 1½ g.p.h.

The plant is normally fitted with a Brush "Square Path" self-regulating alternator, but a "Magnicon" self-regulating alternator or any conventional externally regulated alternator can be fitted if required. At present electric starting only is available, battery charging being maintained by the 12 V dynamo fitted to the engine.

PERSONAL AND SOCIAL

News of Men and Women of the Industry

AT a dinner at the Connaught Rooms on 3rd February attended by representatives of the B.E.A.M.A. Steam Turbine and Allied Plant Sections, a presentation was made to **Mr. I. V. Robinson,** Wh.Sc., M.I.C.E., M.I.Mech.E., to mark his retirement from the position of head of these



Lt.-Col. Morcom (left) making the presentation to Mr. I. V. Robinson

sections after thirty-five years' service. The presentation, which was made by Lt.-Col. R. K. Morcom, C.B.E., T.D., comprised an inscribed gold watch and an illuminated album containing signatures of Mr. Robinson's many friends in the industry. Mr. Robinson's work in respect of steam turbine and allied plant is being taken over by **Mr. G. T. H. Spurling,** who was appointed his chief assistant about a year ago. Mr. Robinson will, however, be continuing many of the other activities with which he has been associated.

The Telegraph Construction & Maintenance Co., Ltd., announces that **Mr. J. N. Dean** has been appointed deputy chairman of the company. The executive duties of the board will no longer be vested in a managing director, but will be carried out by a managing board, of which Mr. Dean, as chief executive, will be chairman.

Mr. Murray D. Scott has retired from active management of Marryat & Scott, Ltd., after thirty-four years, but remains as chairman of the company. Mr. and Mrs. Scott are at present on holiday in the Caribbean. **Mr. L. W. Honey,** Associate I.E.E., and **Mr. L. J. Gooch,** A.M.I.E.E., are appointed joint managing directors of the company. Mr. Honey will operate from the Hounslow Works, and Mr. Gooch from the London Office.

Mr. Honey joined the company in 1918 and became a member of the board in 1940. He was largely responsible for the company's present standardization policy and is the author of "Lifts," published by Marryat & Scott.

Mr. Gooch was apprenticed to the late Howard Marryat in 1914 and joined Marryat & Scott, Ltd., in 1923, becoming a director in 1940. He is the author of "Electric Lifts" (Pitman).

Mr. R. Nicholls (William Sanders & Co. (Wednesbury), Ltd.) and **Mr. B. W. Pickup** (Falk, Stadelmann & Co., Ltd.) have been re-elected chairman and vice-chairman respectively of the Association of Manufacturers of Small Switch and Fuse Gear. They also continue to be Association's representatives on the Fair Trading Council.

Mr. A. R. Taylor, A.M.I.C.E., A.M.I.Struct.E., has been appointed to succeed **Mr. A. E. Brook,** A.M.I. Struct.E., as senior assistant engineer (civil) in the Generation Construction Department, Sheffield, of the Yorkshire Division, B.E.A. Mr. Taylor was educated at Manchester Grammar School and Salford Technical College. He served an apprenticeship in structural engineering with Edward Wood & Co., Ltd., and from 1943 to 1947 he was in the Royal Engineers. From 1947 to 1950 he was an assistant civil engineer with C. S. Allott & Son, consultants, of Manchester, and from 1950 to 1952 third assistant in the Merseyside and N. Wales Division under Mr. W. H. C. Pilling. Since 1952 he has been second assistant in the East Midlands Division, chiefly concerned with the Spondon and Northampton projects.

Mr. E. F. Westwood, M.Eng., M.I.E.E., mains engineer to the No. 6 (Lakeland) Sub-Area of the North Western Electricity Board, and a former engineer and manager of the Morecambe and Heysham Corporation Electricity Department, has been appointed purchasing officer to the Board

Mr. E. F. Westwood

with effect from 1st March. He succeeds **Mr. F. Linley,** who, as we have already reported, has been appointed manager of the Board's No. 1 Sub-Area.

Mr. Westwood is forty-eight, and was born at Barrow. He was educated at Barrow Grammar School and Liverpool University, and in 1927 joined the Barrow Corporation Electricity Department. Eight years later he was appointed senior technical assistant to the Mid-Southern Utility Co., Aldershot, and in 1940 he became engineer and manager at Morecambe and Heysham, which post he retained until nationalization, when he first became assistant planning engineer to the Board's Lakeland Sub-Area, and then mains engineer.

Mr. B. C. Skinner, general sales manager of Arrow Electric Switches, Ltd., has been appointed a director of the company and is undertaking a

Mr. B. C. Skinner

world tour. In the United States he will spend six days with the parent company at Hartford, Conn. From there he will go to San Francisco, New Zealand and Australia, returning to this country in early April.

Mr. A. C. Monteith, vice-president in charge of engineering with the Westinghouse Electric Corporation, has been nominated as the 1954-55 president of the American Institute of Electrical Engineers.

Mr. R. Appleby who joined Black & Decker, Ltd., in 1953 has been appointed a director and general manager of the company.

Mr. M. D. Miles, an eighteen year old apprentice with South Wales Switchgear, Ltd., was one of the five recipients of prizes given by the Engineering and Allied Employers' South Wales Association to the apprentices in the South Wales Area considered to have made the best progress, both in works experience and technical studies, in the previous year.

Mr. H. Fawcett, chief assistant in the electrical and maintenance department of the Liverpool City Lighting Department, has retired after fifty-one years' service with the Corporation.

At the request of the Government, the British Electricity Authority has agreed to the secondment of its commercial manager, **Mr. E. R. Wilkinson,** to assist the International Bank for Reconstruction and Development in the technical and economic appraisal of certain international electric power developments. Mr. Wilkinson is leaving by air for Mexico to-morrow. His

Mr. E. R. Wilkinson

activities on behalf of the International Bank will be principally concerned with that country. The work is likely to occupy his attention for several months. It may be considered a success for this country that the Bank has asked for the services of a leading British expert on electric power development.

Mr. E. J. Davies (Wandsworth Electrical Manufacturing Co., Ltd.) and **Mr. P. E. Wheatland** (General Electric Co., Ltd.) have been elected chairman and vice-chairman, respectively, of the Association of Manufacturers of Electric Wiring Accessories. They have also been appointed the Association's representatives on the Electrical Fair Trading Council.

The annual dinner and dance of the **Southern United Telephone Cables, Ltd.,** was held at the May Fair Hotel, London, on 12th February, Mr. W. F. Bishop (chairman) presiding over a gathering of over 300 members of the staff and guests. The toast of the company was proposed by Mr. G. R. King, a member of the high-frequency laboratory, who referred in felicitous terms to Mr. Bishop's many years in the cable-making industry and in particular his association with telephone cable manufacture. He spoke of the employees' appreciation of the modern facilities which the company had provided at Dagenham, which compared favourably with any industrial establishment in the country.

Mr. Bishop, in a brief response, said he was glad to hear that the amenities provided for the staff were appreciated and it was the company's intention to extend these facilities. He thanked the staff for their loyalty and mentioned that a scheme had been formulated to enable the younger members to acquire the necessary knowledge of their jobs; he hoped that when it came into operation they would take the fullest advantage of it.

Mr. E. J. Vidler (a director) proposed the toast of the guests and particularly welcomed the presence of representatives of the G.P.O., the Ministry of Supply, the company's suppliers, the C.M.A. and other bodies. Mr. C. H. I. Chown (the company's auditor), in reply, said that he had watched the growth of the company since its formation in the 1930's and this had been quite phenomenal. Following the dinner there was dancing and an excellent cabaret.

Hall Telephone Accessories, Ltd., held a celebration dance on 8th February to commemorate its twenty-fifth anniversary. The event, which was attended by very nearly a thousand employees and their guests, was held at the Seymour Hall, W.1. During the evening thirty employees, who had served the company for twenty-five years, were presented with a gold wrist watch, suitably inscribed. The chairman, Major The Hon. M. Guest, made the presentations. Mr. F. W. Hall presented an inscribed watch to the chairman in token of his twenty-five years association with the company. Among those who attended the celebration were Col. The Hon. C. H. C. Guest, Sir Ian L. Orr Ewing, M.P. and Mr. H. C. Croucher (directors).

The annual general meeting of the **Indian Electrical Manufacturers' Association** took place in Delhi recently when the principal guest was Sri K. C. Reddy, Minister of Production, Government of India, who inaugurated the session. In the accompanying picture Mr. C. M. Shaw, a director of the General Electric Co. of India, Ltd., and sales manager of its Calcutta branch, is seen moving a vote of thanks to Sri K. C. Reddy. On Mr. Shaw's right is seated Mr. Humphrey, managing director, A.E.I. (India), Ltd., and on his left Mr. Driessen, managing director, Indian Cable Co., Ltd. Sri K. C. Reddy may be seen wearing a " Gandhi " cap.

Mr. C. M. Shaw (director, General Electric Co. of India, Ltd.) addressing the annual meeting of the Indian Electrical Manufacturers' Association

The annual dance of the senior staff at the Malmesbury works of **E. K. Cole, Ltd.,** was held recently at the works canteen, over 150 attending, including Mr. E. K. Cole (chairman) and Mrs. Cole and a number of directors and their wives.

The annual staff party of **Hurseal, Ltd.,** was held on 29th January at Kingsley Hotel, Bloomsbury Way, W.C.1. Among those present were the chairman, Mr. F. S. Bassett, Mr. B. L. B. Hutchings and Mr. J. Judge (directors), and Mr. A. C. Hazel (managing director).

A dance and social was held by **J. Day & Co. (Derby Works), Ltd.,** at the Shakespeare Hotel, Woolwich, on 6th February. Approximately 250 people attended including representatives of several of the Ministries and other guests. The managing director, Mr. S. Day, accompanied by his wife and Mrs. H. Day, were greeted by Mr. Tandy, the works manager.

Mr. J. Petrie has been appointed manager of the Nottingham district office of the Edison Swan Electric Co.,

Mr. J. Petrie

Ltd. Mr. Petrie has been attached to the Dundee district office for twenty-three years, rising to the position of senior representative.

The sixth annual dinner and dance of the **Telcon Staff Association** (Telegraph Construction & Maintenance Co., Ltd., and Submarine Cables, Ltd.), held at the Dorchester Hotel, London, on 12th February, had a record attendance of over 400. Mr. W. R. Martin, personnel manager and chairman of the Staff Association Council, presided, and Mr. J. N. Dean, deputy chairman and chief executive of Telcon, replied to the toast of the company. Among those present were Mr. J. Innes, Mr. B. H. Musgrave and Dr. E. W. Smith (directors) and their ladies. During the evening a message of greeting was received from Mr. W. Glass (director of Telcon and Johnson & Phillips, Ltd.), who was in Moscow on a business mission.

The recently formed North Metropolitan branch of the **Electrical Industries Benevolent Association** is now well established and plans for the extension of the Association's welfare work in the area are laid. The Branch Committee would welcome news of

cases of need in its area, which includes the North of London from Wembley to Enfield and Waltham Abbey, and extends through most of Hertfordshire to St. Albans, Hatfield, Hoddesdon, Bishops Stortford, Welwyn Garden City, Hitchin, Letchworth and Baldock. The hon. branch secretary is Mr. T. Yule, B.E.A., Eastern Division, Northmet House, Southgate, London, N.14; the chairman is Mr. C. C. Hill, manager of the Northmet Sub-Area, Eastern Electricity Board; and the hon. treasurer, Mr. D. W. Kaye, Thames Wire & Cable Co., Ltd., Hoddesdon, Herts. On 24th March next the branch will be holding its first annual dinner and dance, at the Waterend Barn Restaurant, St. Peter's Street, St. Albans. Tickets (30s each) can be obtained from any of the branch offices.

OBITUARY

Mr. William Alfred Tookey, M.I.Mech.E., the well-known consulting engineer and specialist on gas producers, internal combustion engines and power plants generally, died on 9th February at the age of eighty-three. He was the author of "Gas Engine Manual," "Oil Engines," and "Producer Gas Plants." Among his many activities as a member of technical societies, he was a past-president of the Institution of Automobile Engineers and of the Junior Institution of Engineers.

Mr. Joseph Lewis, who retired from the position of joint general manager of the Marconi International Marine Communication Co., Ltd., in 1948, died on 9th February, at a London hospital, at the age of sixty-nine. Mr. Lewis joined the Marconi Marine Co. as a sea-going wireless operator in 1902 and held various positions within the company until his appointment as assistant general manager in 1928. He played an important part in the introduction of the echometer by the Marconi Co., and became joint (and later sole) general manager and a director of the Marconi Sounding Device Co., Ltd. He was subsequently joint general manager of the Marconi International Marine Communication Co.

Mr. J. W. Stevens, one of the founders, in 1917, of the Express Lift Co., Ltd., died on 9th February during an operation. He was sixty-seven. Mr. Stevens joined Easton Anderson & Goolden in 1900 and subsequently worked for the Easton Lift Co., Ltd. He acted as managing director of the Express Lift Co., Ltd., from 1923 to 1936. From that time he continued as a director and sales manager until his retirement last July.

Mr. W. E. Maddock.—The death occurred on 9th February of Mr. William Edmond Maddock, late secretary of the Uxbridge & District Electric Supply Co., at the age of sixty-six.

Belfast Plant Contracts

UNDER the Electricity (Essential Supplies) Bill, which was presented in the Ulster House of Commons on 10th February, the chairman of the Northern Ireland Joint Electricity Committee is to be given authority under the Minister of Commerce to place contracts for plant and other equipment for the new Victoria power station, Belfast. The Bill was introduced a few hours after the Corporation had decided by a majority vote to ask the Minister to undertake the placing of the contracts. The Government is expected to hurry the Bill through.

The text of the Bill states that "by reason of many grievous delays and difficulties, the Corporation have not entered into all the contracts necessary to carry out and give effect to the schemes, and in consequence the future provision of supplies of electricity adequate to the needs of the community is gravely endangered."

The chairman of the Joint Electricity Committee will exercise on behalf of and to the exclusion of the Corporation certain functions with respect to the carrying out and giving effect to the schemes, and these functions are detailed.

Mr. Wilson asked the Minister whether he was aware that Babcock & Wilcox had intimated that they held a contract for the erection of the boiler plant for the extension of the Belfast electricity station, and that they would not quote other firms for the supply of Babcock & Wilcox stokers, which were specified in the tender forms; and whether he would investigate this contention and take steps to see that such impediments would not prevent the establishment of conditions of open competitive tendering when the tenders came to be examined.

Lord Glentoran said he understood that a claim in the sense indicated had been made by the company, but it was not for him to express any opinion on that subject, or on any course of action taken by the company in relation to the conduct of its own business.

Mr. Wilson referred to a letter which was said to have been sent by Lord Glentoran's predecessor to the Corporation advising it to take action which was contrary to its standing orders, and asked whether Lord Glentoran was aware that the advice was clearly stated that the Corporation was to take certain action and place the contract with Babcock & Wilcox. Was he not aware that in a court case which sought interpretation of the standing orders of the Corporation this had been proved to be irregular? Was it not obvious, he asked, that the Ministry had played a great part in delaying this contract until a situation had now arrived where they said the only thing to do was to place the contract for the Corporation with the company they wanted to give it to all along? Lord Glentoran denied that this was the case.

Lighting and Road Safety

SPEAKING at a conference in London on Monday of this week, which had as its theme better street lighting as a means of reducing road casualties, Mr. W. Robinson, lighting officer, British Electrical Development Association, said although it was well known that roads were more dangerous after dark than during daylight hours, the extent of the danger was apparently not fully realized. Out of all that had been written and spoken in recent years concerning road safety, hardly any mention had been made of the alarming situation regarding night-time road accidents.

The Street Lighting Committee of the British Electrical Development Association had recently instituted a study of the official road accident figures, and the outcome of this study had presented some interesting facts. It was pointed out that this investigation was commenced before the road accident figures for 1953 were known and that the facts disclosed related to the entire post-war period. In 1952, out of every 1,000 reported road casualties, there were 19 fatal accidents by day compared with 33 by night, and the corresponding figures for those seriously injured were 227 by day and 287 by night. Out of every 1,000 adult pedestrian casualties, 37 were killed by day and 65 were killed by night, and the number of seriously injured was 245 by day and 330 by night.

The situation was getting worse as, since 1945, the number of motor vehicles licensed had increased from three to five millions. The number of adult persons killed at night was 64 for every 100 by day during 1945, whereas in 1952 more than 100 were killed at night for every 100 by day.

According to the study, these facts could only be attributed to bad visibility and the only hope of improving the situation lay in providing safe visibility for all road users after dark. It was advocated that restrictions on street lighting should be lifted and that the modernization of existing street lighting should receive the highest priority.

PARLIAMENTARY REPORT

MR. BUTLER, the Chancellor of the Exchequer, announced in the House of Commons last week that there would be no further changes in the Purchase Tax schedule either in or before the Budget. He said that he made this announcement to meet the general desire to end the uncertainty about possible further changes in the tax.

Earlier in the week Mr. Boyd-Carpenter, the Financial Secretary to the Treasury, moved the approval of the Purchase Tax (No. 1) Order, dated 1st January, 1954, which, he explained, had the effect, among other things, of reducing from 75 to 50 per cent the tax on electric space heaters, immersion heaters and geysers. These articles would thus be taxed at the same rate as other domestic electrical appliances, and they also came down to the rate on equivalent gas apparatus. It seemed reasonable to bring them down to that level, particularly as there was some evidence that the high rate of tax had had some effect on production and there had also been some tendency to lowered quality and therefore, perhaps, to lowered safety. Fabric lampshades also came down from 50 to 25 per cent, and jewellery and silverware from 75 to 50 per cent.

Mr. Jay asked whether the decision of the Government to reduce the tax on electric fires meant, in spite of all that had been said about fuel efficiency in many learned reports and the wasteful character of electric fires, that the Government proposed to abandon purchase tax altogether as an instrument for achieving greater fuel efficiency.

Mr. Nabarro said he was dubious about the decision to reduce, in a discriminatory fashion, the tax on electric space heaters. We had avoided power cuts this winter by only a tiny margin, and only by bringing into operation every generating set in every power house in the country.

Mr. James Hudson, on the other hand, thought it was all wrong that they should be still considering the imposition of a 50 per cent tax on water heating, whether it were by gas or electricity.

Mr. Butler, in his reply, assured Mr. Nabarro that he was not going back on his great campaign for fuel conservation, which was very close to his heart. The general position in regard to electric space heaters was that the Treasury was informed that the penal rate of taxation imposed by the Labour Government, but reduced by his (Mr. Butler's) benign attentions last Budget to 75 per cent, was still a penal rate resulting in the production of cheaper, less efficient, and sometimes dangerous appliances. They therefore found it necessary, on representations not only from the trade but also from experts, to lower the extent of the tax, and they did not see any reason for imagining that the policy of fuel wasting would be encouraged by this step. After consultations with the B.E.A., he did not think that either peak periods or any others would be affected. The matter had been examined with great care.

The order was approved by 268 votes to 241.

Civil Defence (Electricity Undertakings) Bill

Mr. Joynson-Hicks, Parliamentary Secretary, Ministry of Fuel and Power, moved the second reading of the Civil Defence (Electricity Undertakings) Bill. He said the Bill would ensure that the electricity industry was able to maintain its services, as far as was practicable, despite the results of hostile attacks against it. The Bill re-introduced into the Civil Defence Act of 1939 the electricity industry, which was removed from it during nationalization.

Mr. A. M. F. Palmer asked how far the money would go. Looking at the trivial nature of the sum involved, he wondered whether the matter was being studied seriously. If it was a job which had to be done, it was worth doing well. It seemed that in the coming year they were likely to spend just over £2 million, that was if the plant and equipment were available to make the spending of this money realistic. Towards ensuring the due functioning of electricity undertakings in the event of attack that amount of money obviously would not go very far. It was mainly for the provision of spare plant, extra transformers, switchgear and so on, easily replaceable if standing plant should be destroyed or damaged. They were still very much in the dark as to what effect another war, if it should unfortunately come, would have on the functioning of public utility undertakings. He was wondering if the Government was looking to the effective functioning of the electricity undertakings. For instance, he supposed that with atomic warfare it would be necessary to design very special types of emergency power stations, some, perhaps, deep underground, to provide a minimum electricity supply should the normal above-ground stations be put out of action.

Mr. Noel-Baker said that in the event of an atomic attack by far the greatest danger to power stations would be residual radioactivity. The Minister should attempt to provide some underground shelter.

Mr. Joynson-Hicks assured Mr. Palmer and Mr. Noel-Baker that the points to which they had drawn attention were very well within the knowledge and scope of those responsible for the civil defence of the electricity industry. Anyone who had attended the civil defence course at the B.E.A.'s place at Horsley Towers could not fail to be struck by the realistic and practical way in which they were endeavouring to learn how to tackle this problem. What was intended to be done by the powers conferred under the Bill was to try to ensure that the most vulnerable points were either protected or duplicated so that if there was some part of the system eliminated or temporarily put out of action, something else would be able to take its place, or there would be repairs or alternative supplies immediately available. In answer to Mr. Palmer, he believed that the estimate was a figure which the industry would be hard pushed to spend during the course of the financial year. Obviously, it was not a " once for all " payment. Protection would have to be continued as the industry developed.

The Bill was read a second time and the money resolution agreed to in Committee.

Suppressors on Cars

Mr. Harrison asked the Assistant Postmaster General what information was available about the response, by motorists and others using electrical appliances likely to cause interference to television reception, to the campaign for the fitting of suppressors, and what further measures were contemplated.

Mr. Gammans said his information was that more suppressors were being fitted voluntarily on cars than previously and therefore the Government proposed to continue its campaign on the present lines. The response to specific requests to fit suppressors on electrical appliances remained good. The Postmaster General had now received reports from the committees appointed to advise him on interference from small electric motors and refrigerators and he hoped shortly to lay regulations before Parliament.

Monopolies Commission

Mr. Eric Fletcher asked the President of the Board of Trade what industries were now the subject of investigation by the Monopolies Commission.

Mr. Peter Thorneycroft said the industries were:—Copper semi-manufactures; electrical machinery; pneumatic tyres; buildings in Greater London; hard fibre cordage; linoleum; sand and gravel in central Scotland; and industrial and medical gases. The Commission was also investigating, under Section 15 of the Monopolies Act, the general effect on the public interest of certain widely prevalent discriminatory practices.

Mr. Denis Healey asked the Minister of Supply if he would now make a statement on the Government's conclusions with regard to the report of the Monopolies Commission concerning electric wires and cables.

Mr. Low said that the Minister hoped to be in a position to make a statement on this subject shortly.

British Columbia Contract

Commander Donaldson asked the President of the Board of Trade, in view of the large orders placed in Britain for underwater electric cable to be laid from Vancouver Island to the mainland of British Columbia, what goods had been, or were about to be, purchased from British Columbia.

Mr. Thorneycroft said he was very glad that a British firm had been awarded this important contract. Although we did not try to link particular purchases with particular sales, contracts of this kind, whether secured in British Columbia or in other parts of Canada, helped us to finance our purchases from British Columbia, which were in fact immensely larger than her purchases from us.

Television Bill

Mr. Ness Edwards asked when the Bill providing for commercial television would be available.

Mr. Gammans said shortly: but he could not yet name a precise date.

V.H.F. Broadcasting

Mr. Ness Edwards asked if the Government had yet taken any decision on the recommendations of the Television Advisory Committee, and had now acceded to the request of the B.B.C. for approval of the plan to provide complete national coverage for three sound programmes by means of very high frequency broadcasting.

Mr. Gammans said that the Postmaster General had decided to accept the recommendation of the Television Advisory Committee that frequency modulation should be adopted for v.h.f. sound broadcasting. The B.B.C.'s proposals for making a start on an initial group of stations were now under discussion with the Corporation, and further developments would be considered in due course.

Cost of Scottish Schemes

Mr. Nabarro asked the Secretary of State for Scotland what steps he was taking to scrutinize the respective sums authorized by Parliament for each constructional scheme promoted and completed by the North of Scotland Hydro-Electric Board since 1946, and the respective sums actually expended by the Board for each constructional scheme; and what was the aggregate disparity between estimates authorized by Parliament and actual costs since 1946.

Mr. Henderson Stewart said that the consent of the Secretary of State was required to the borrowing by the Board of the sums needed to carry out its constructional schemes and he was therefore in a position to consider the difference between these sums and the estimated costs given in the schemes presented to Parliament. In the case of the six completed hydro-electric schemes, estimated between 1944 and 1947 to cost £12,060,000, the sanctioned borrowing amounted to £27,825,600. In the case of seven transmission line schemes, estimated between 1947 and 1951 to cost £4,040,000, the sanctioned borrowing amounted to £4,714,870.

Mr. Nabarro asked what were the respective values of the fixed assets of each of the South West, the South East, and North of Scotland Hydro-Electric Boards, expressed as an aggregate of all generation transmission and other ancillary electricity fixed assets; and what would have been the value of the fixed assets of a single Scottish authority for electricity generation, transmission and sales, on the date concerned.

Mr. Henderson Stewart said that the net value of the fixed assets of the South East Scotland and South West Scotland Boards at 31st March, 1953, totalled £9,210,028 and £15,057,691, respectively. These figures did not, of course, take account of the fixed assets of the British Electricity Authority in the south of Scotland. The net value of the fixed assets of the North of Scotland Hydro-Electric Board at 31st December, 1952, was £78,318,654. It was estimated that the net value of all the fixed assets concerned in the whole of Scotland at this period was about £130 million.

Highland Railways

Mr. Nabarro asked the Secretary of State for Scotland what steps he was taking to support the policy and endeavours of the North of Scotland Hydro-Electric Board to electrify appropriate Highland railway routes.

Mr. Henderson Stewart said that this was a matter for the British Transport Commission, with whom he understood the Board had had discussions.

Rural Electrification

Mr. Godber asked the Minister of Fuel and Power if he would make a statement on the general progress of rural electrification.

Mr. Geoffrey Lloyd said that since the Government's approval of an increase in the capital to be used for rural electrification and his consultations with the chairmen of the Boards, there had been a remarkable increase in the number of farms connected. As compared with the year before, the number rose during the last six months of 1953 by 32 per cent and in the last quarter of the year the number was 4,465, which was 41 per cent higher than the corresponding figure for 1952 and a record achievement. Some 60,000 other rural premises had also been connected during the year. This achievement showed how much the Boards had increased the pace of this work and they were now making preparations to carry electricity to the more remote areas.

Electricity in Mines

Mr. Robert Taylor asked the Minister of Fuel and Power what saving of coal had been made to date as a result of replacing colliery steam-raising plant by taking power from the grid; and what would be the saving of coal when electrification was completed.

Mr. Geoffrey Lloyd said it was difficult to make a sound estimate of these savings, but in the four years to 1952 the National Coal Board's consumption of electricity went up by 775 million kWh and its coal consumption fell by one million tons.

Employees and Scottish Bill

THE Employees' National Committee for the Electricity Supply Industry has decided unanimously to express to the Secretary of State for Scotland the extreme concern felt by the trade unions at his refusal so far to embody in the text of the new Electricity Reorganization (Scotland) Bill the principle of United Kingdom negotiations for wages, salaries and conditions.

The Committee is making it clear to the Minister that the principle of national negotiations is a matter of vital importance to the trade union movement in Scotland, as in the rest of the United Kingdom.

The Committee is to inform both the T.U.C. and the Scottish T.U.C. of the position, pointing out that the Government's attitude may establish a dangerous precedent for other nationalized industries. The Committee will take every constitutional course open to it to bring about a more satisfactory labour relations clause before the Bill completes its course in the House of Commons.

The Employees' National Committee is made up of the following trade unions and staff associations which have negotiating agreements with the British Electricity Authority:—Amalgamated Engineering Union; Association of Managerial Electrical Executive; Clerical & Administrative Workers' Union; Electrical Power Engineers' Association; Electrical Trades Union; National and Local Government Officers' Association; National Federation of Building Trades Operatives; National Union of Enginemen, Firemen, Mechanics & Electrical Workers; National Union of General & Municipal Workers; and Transport & General Workers' Union.

INDUSTRY AND THE HOUSE

Debates on Scottish Reorganization and Civil Defence Bills

By A. M. F. PALMER, A.M.I.E.E., M.P.

MR. GERALD NABARRO, the ebullient Conservative Member for Kidderminster, has a trick of giving notice of his intention to take part in a debate by putting down preliminary questions on the Order Paper. He did this before the Scottish electricity debate and elicited the interesting figures from Mr. James Stuart, Secretary of State for Scotland, that in 1953 on the main transmission lines 211 million kWh was sent from Scotland to England and 237 million kWh from England to Scotland, giving a net *import* into Scotland of 26 million kWh. This fact would seem to confound those Scottish enthusiasts who often represent their fair land as being shamelessly milked of electrical energy at cut price rates for the advantage of the piratical English.

The Second Reading debate on the Electricity Reorganization (Scotland) Bill was altogether a lively occasion, ending, as I predicted a fortnight ago, in the Labour Opposition dividing the House. The Secretary of State was modest and brief in his introductory speech. He said the Government had felt it right to review existing arrangements in the light of experience, taking into account also Scottish opinion. Mr. Stuart did not bother to say just what experience had compelled the Government to propose the change and this remained the central mystery of the debate, even after Opposition front bench speakers such as Mr. Woodburn and Mr. McNeil had expressed their curiosity. Was there an expert committee (similar to the Weir and McGowan Committees) which had guided the administration? Later the B.E.A. Reorganization Committee was dragged in; had this discreet and careful body looked into the matter? Smiling silence greeted every inquiry.

North-South Division

Mr. Nabarro, after flinging his zealously garnered statistics into the debate with great abandon, showed surprising originality for a politician. He thought the Scottish Unionists should have fulfilled their electoral promises and brought in a single Board for all Scotland. He pointed out that the electrical dividing line between North and South Scotland was not an exact frontier between hydro and thermal generation; the Hydro Board possessed steam stations and the new South of Scotland Board would be responsible for water power in Galloway.

Sir Arnold Gridley was the solitary voice on the Government side who found a technical and administrative justification for the Bill. He said that it was a fundamental mistake to separate generation from distribution and by so doing, of course, condemned the principles of both 1947 and 1926. Sir Arnold was fair enough to admit that many experienced men disagreed with him.

The risk that the Bill, if it became an Act, would split the arrangements for wage and salary negotiations and do away with United Kingdom responsibility was much to the front in the speeches of Labour Members. However, Ministers were courteous and conciliatory on the point; it is possible that an amendment restoring national negotiations will have a favourable reception at the Committee Stage when it is taken on the floor of the House.

In his reply to the debate Mr. Henderson Stewart, the Scottish Under Secretary, stated frankly that the Government had first decided on its policy and had afterwards consulted the authorities; he confessed that this was not to say that the B.E.A. was in favour of the new proposals. The Bill was given a Second Reading by a majority of thirty votes; several Scottish Labour Members abstained and at least one stout Welshman, who apparently looked on the Bill as a valuable precedent for Wales.

Civil Defence

Electricity was again to the front on Thursday evening, when the Civil Defence (Electricity Undertakings) Bill was debated. The intention of this measure is to provide Government funds so that electricity supply can maintain its services as far as is reasonably practical under enemy attack in the event of war.

As Mr. Joynson-Hicks, Parliamentary Secretary to the Ministry of Fuel and Power, explained, a curious situation had arisen as a result of legislation in recent years. The 1939 Civil Defence Act had contained a specific provision covering electricity supply, but because of the Electricity Act, 1947, and the consequent abolition of the Central Electricity Board and the Electricity Commissioners, the arrangements for civil defence, bound up with the existence of these bodies, were repealed. The present Bill sought to make good that lapse.

Mr. MacColl, a Labour Member who sits for Widnes and is on the Select Committee on Estimates, was sharp to make the point that, as that body had pointed out in its not very favourable comments on civil defence organization, the lack of powers to make money available was known as early as 1949. Lawyers and officials in the Ministries had gone on arguing about ways of overcoming the difficulty for over three years; it was only now, having been apparently unable to agree on any other method, that this present belated measure had been brought in. He thought this kind of thing justified the strong language used by the Estimates Committee in its Report.

After other Opposition speakers had blessed the general intention of the Bill, Mr. Joynson-Hicks, speaking again by leave of the House, defended the Government and said if there had been delay it was the responsibility jointly of both the present and the previous administrations. But he doubted if anything very much had been lost. During the last few years the electricity industry had been stretched to the utmost limit to find plant to maintain everyday supplies; stock-piling in practice would have been out of the question however much money had been available for purchases.

Parliament and Nationalized Industries

A piquant parliamentary situation arose when the House debated the Report of the Select Committee to examine the methods by which Parliament is informed of the affairs of the nationalized industries. The Government itself took a benevolently neutral attitude towards the suggestion that a permanent Select Committee to investigate the affairs of the nationalized industries should be appointed. Mr. Herbert Morrison, speaking officially for the Opposition, was strongly against the idea; Conservative back benchers were unitedly in favour, Labour back benchers

divided. At the conclusion Mr. Crookshank, Lord Privy Seal and Leader of the House, after apologizing to those Members who had not had an opportunity of intervening because of lack of time, hinted that the Government might table a future motion.

Mr. Herbert Morrison made an impressive speech, perhaps one of his best in the House for some years. He conceded that a case for direct parliamentary control might exist for public services like electricity and gas (although if it were so he would prefer to have a Government Department like the Post Office), but transport, coal, iron and steel were primarily commercial undertakings—publicly owned. It was vitally important, therefore, said Mr. Morrison, that the men in charge of them should be animated by commercial enterprise and a willingness " to chance their arm." If these men felt that for every decision they made they were liable to be called up to Westminster and put " through the mill " by M.P.s, who were " a pretty clever lot at putting questions," then the experts would inevitably wonder whether their commercial reputation would suffer and would play for safety.

Mr. Ernest Davies, generally regarded as one of the Labour Party's authorities on nationalization, was all in favour of a standing Select Committee, because of knowledge gained in many directions since the vesting dates. He thought so-called parliamentary interference was a far lesser evil than the ministerial near-dictatorship which was tending to develop now behind the scenes. Mr. Spencer Summers, a Conservative industrialist who sits for Aylesbury, supported him and said it was not necessary that there should be a cross-examination of experts by other experts. He thought the members of the parliamentary Select Committee would be roughly in the same relation to the management of nationalized industries as spokesmen for shareholders were at a company meeting in relation to the directors.

Improvement in South Australia

THE latest report (1952–53) received from the Electricity Trust of South Australia is in marked contrast to those of most electricity undertakings since the war. In place of restrictions, higher costs and the like it tells of a year of " outstanding achievement in production and construction as well as financially." There was a revenue surplus of £336,932; sales rose by 10 per cent; all previous records were broken for the length of transmission lines built and consumers connected; tariffs were reduced; and basic wages remained comparatively stable, while the cost of living adjustment was actually downward for the first time since 1944.

An important factor in the undertaking's improved finances was the considerable increase in use made of the cheaper Leigh Creek coal, production of which is controlled by the Trust. This was made possible by the operation of new boilers at Osborne " B " power station which are designed to burn either Leigh Creek or New South Wales coal. As the price of the latter advanced further during the year, from £5 2s 7d to £6 6s 10d a ton—in 1950 it was only £3 8s 10d—the increased use of Leigh Creek fuel was especially advantageous. Accounts of the Leigh Creek coalfield show that the net cost at site was £1 12s 11d a ton and the average price received during the year was £2 13s 2d a ton.

Electricity generated at the Osborne " A " and " B " stations totalled 686·4 million kWh and at country stations 10·5 million kWh. Sales aggregated 576·2 million kWh. In the case of domestic consumers the average annual consumption was 1,660 kWh compared with 1,560 kWh in 1951–52; in 1939–40 it was only 490 kWh. It is estimated that over 27 per cent of domestic consumers now cook by electricity against 10 per cent in 1945. At the end of the year the total number of consumers was 177,934, an increase of 12,372, including 786 taken over on the acquisition of the Wallaroo undertaking.

The fourth 30 MW turbo-alternator at Osborne " B " was commissioned on 11th May last, making a total capacity of 199 MW in the two stations. Two further sets and four boilers are scheduled for operation in 1956 and 1957. At the new Port Augusta station component parts of the first two 30 MW sets were received towards the end of the year under review. A further power house is projected at Port Augusta and investigations are also proceeding into the establishment of a station in the south-east to burn wood waste from timber mills. During the year officers of the Trust visited atomic energy research establishments in England and the United States to gain information on the possible future use of atomic energy for the production of electricity. It was also decided to investigate the feasibility of wind power generation.

Ground-Wave and Irregular Terrain

TWO official communications from the Radio Research Station, Department of Scientific and Industrial Research, were presented last week before the Radio Section of the Institution of Electrical Engineers. The first, by Dr. J. A. Saxton, was an " integrating " paper, giving a perspective of developments leading to present practice relating to basic ground-wave propagation characteristics in the frequency band 50–800 Mc/s. The relationship was first discussed between existing experimental data on transmission at very high frequencies, at distances such that variations in atmospheric refractive index are of little significance, and fundamental propagation theory.

Considering the effects of irregular terrain, the author said that at about 50–70 Mc/s there appeared to be little difference between median field strengths observed and those calculated for a smooth country up to about 100 km. As the frequency was increased above 70 Mc/s, however, the observed median field strengths fell more and more below ideal theoretical values, reaching 20 db at 700 Mc/s. Divergence of practice from theory at any given frequency appeared to be not greatly dependent on either terminal height or transmission distance, provided this was not beyond the normal horizon range corresponding to the terminal heights. An empirical correction factor and basic ground-wave characteristics were suggested as applicable, except in very mountainous country or in densely built-up areas.

For the second paper, which was concerned with ground-wave field-strength surveys at about 100 and 600 Mc/s, Dr. Saxton had as co-author Mr. B. N. Harden. Their experiments at the lower frequency median (distance) showed that while field strengths did not differ greatly from the values calculated for propagation over a smooth earth, they increased greatly with frequency. Near 600 Mc/s the median field strength for any given distance within 80 km might be 20 db below smooth-earth values. For a receiving-aerial height of 9 metres, considerable further attenuation might be experienced in heavily built-up areas

VIEWS on the NEWS

By REFLECTOR

WHENEVER the temperature in this country falls below freezing point public attention is forcibly drawn to the shortcomings of the water supply arrangements in most British houses. Housing authorities, architects and builders are then the subject of unfavourable comment because they appear to be indifferent to the possible results of their attempts to cut down costs at the risk of inconvenience and actual danger to householders. It is fortunate for them that there is no direct relation between British weather and domestic electrical installations or in this direction, too, they would periodically come under the householder's criticism. Undoubtedly there have been improvements in recent years but it still cannot be said that the generality of these installations are really sufficient or properly planned. I suggest that the time has come for a repetition of the campaign for adequate wiring which E.D.A. conducted some years ago.

* * *

Encouraged by the success of the Scots in persuading the Government to give them electrical autonomy, the Welsh have intensified their campaign for similar treatment. Plaid Cymru (the Welsh Nationalist Party) is applying a spur to Welsh M.P.s to get them to demand separation from the English electricity supply system. Plaid Cymru contends that the B.E.A. is making enormous profits from Welsh electricity and will do even better with the new generating stations at Connah's Quay, Uskmouth, Carmarthen Bay, Rogerstone and Leys in operation. The implication seems to be that if a Welsh Board took over these stations Wales would be well off; and so it would be if it got the stations for nothing. The new Scottish Board will owe the B.E.A. quite an appreciable sum for the assets which it will acquire; it looks as though Wales would have an even greater capital burden with the new stations. I wonder if these stations will all be self-supporting at the present rates of charge or whether some of their costs will not be borne by the rest of the B.E.A. system. Plaid Cymru should not airily assume that the people of Wales would be better off under segregation. So far the Government has not been sympathetic to this purely nationalistic move.

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If, as seems unlikely at the moment, Wales as well as Scotland was taken out of the British Electricity Authority's hands there would be a good case for re-naming the B.E.A. as the " English Electricity Authority." Not only would this be a refreshing innovation (for the English are a forgotten race), it would also put an end to the confusion caused by the Authority's present initials. I cannot trace any organization with the initials " E.E.A." although in these days of alphabetical nomenclature one cannot be certain that there isn't one.

* * *

The idea of using household refuse for the generation of electricity has, on the face of it, that " something for nothing " attractiveness, but the fact that it has so seldom been adopted signifies that there is a " nigger in the refuse pile." I see that the subject is discussed in the *Manchester Guardian* whose Political Correspondent mentions the Ministry of Housing's views. Apparently the generation of electricity, or district heating, from refuse has had some success in Switzerland but that is put down to the fact that Swiss domestic rubbish is of a more combustible character; for instance there is less coal ash than is found in British refuse. In this country, where coal is cheaper, " incinerator " electricity might by comparison seem expensive. Another point is the difficulty of guaranteeing a regular supply to keep a generating plant going at times when electricity is needed. Glasgow has an incinerator station which, says the Ministry, works at a loss. Croydon closed one at the outbreak of war and has never re-opened it, and another (unnamed) authority closed its incinerator at the beginning of the war and has since dismantled it; an ordinary power station has been built in its place.

* * *

Somewhat confused thought is manifested in a recent *Recorder* report. It deals with a Press release from the British Electrical and Allied Manufacturers' Association about the electrification of a farm, the manager of which is a prominent B.B.C. actor. This fact is merely mentioned incidentally in the B.E.A.M.A. document and yet the *Recorder* says:—

> " Participants in the recent discussions on commercial radio and television in this country will be surprised to learn that amid all the controversy on the subject we already have commercial radio right here in Britain. And who are the perpetrators of this act against the sanctity of our present broadcasting system? Why the B.B.C.! "

How this constitutes " commercial radio " I am at a loss to understand. The B.B.C. might as well be held responsible for the frequent advertisements of all sorts of commodities in which the portraits of well-known radio characters appear.

* * *

Seventy years ago the *Electrical Review* was involved in a controversy over the true inventor of the telephone. In the issue of 16th February, 1884, Alexander Graham Bell was praised as the man who had " effected a useful improvement in that which was virtually a practical invention years before." Credit for the actual invention of the telephone was given to an American, Daniel Drawbaugh, who was said to have started work on electrical speech transmission in 1860. A specific date for Drawbaugh's invention was given in a letter from A. C. Barney in the issue of 23rd February—1866. But this Mr. Barney brought forward four predecessors:—Antonio Meucci, 1849; Charles Bourseul, 1857; Philip Reis, 1861; and Manzetti, 1865. He also maintained that Bell was forestalled by another—James McDonough—by a matter of a few months in 1876, the date of Bell's first patent. There was a great deal more discussion in later issues. In the same year the American Bell Telephone Co. secured a decision in Bell's favour, against Drawbaugh's claim, in the American courts which apparently settled the matter legally if not historically.

INDUSTRIAL NEWS

New Fluorescent Tubes

THE Electric Lamp Manufacturers' Association announces that on 1st March its members are introducing a lamp with a new colour and at the same time making a considerable improvement in the efficiency of " warm white " lamps.

After prolonged research its members are introducing fluorescent tubes which will have a special appeal for " social " lighting. The new lamps give a light resembling that of tungsten filament lamps in both its appearance and its rendering of colours; one advantage, therefore, is that it will blend very satisfactorily with light from tungsten filament lamps. Practical experiments have been conducted with the new lamps showing that they are eminently suitable for lighting premises where the public congregates for either leisure or business. The lamps will be known as " de luxe warm white " and will be available in all the usual sizes. The 80 W lamp (type MCF/U) will be 14s 6d. Prices for other sizes may be had on application to the makers.

The " warm white " lamp has been improved in efficiency, the 80 W size by as much as 15 per cent; at the same time the colour appearance will be better. Prices will be unchanged and to ensure that these lamps are obtained they should be ordered as " new warm white."

Demonstration Kitchens

Monday last saw the inauguration of the new demonstration kitchens and demonstrators' training school of the Jackson Electric Stove Co., Ltd., at 267, Pavilion Road, London, S.W.1. The training school, which is in the hands of two senior members of Jackson's demonstration staff, Mrs. M. A. Scallan and Mrs. L. Worboys, is entirely free, and prospective demonstrators are expected to have a thorough grounding in cookery and to hold some recognized qualification. Training is also offered to demonstrators already in the employ of Electricity Boards and refresher courses can also be arranged. The practice kitchens can accommodate six trainees during each course, usually of a week's duration.

The new Jackson demonstration kitchens

Electrical Contracting Dispute

Employees of members of the National Federated Electrical Association in the Manchester area continued their strike during last week but returned to work on Monday last. The Electrical Trades Union claimed that " 100 per cent " of its members in the area had ceased work but a representative of the N.F.E.A. said that this was far from being the case.

The general secretary of the Union said on Friday last that the area for this week's strike would be Northern Ireland. On Tuesday there would be a one-day strike in the London area and on Wednesday 300 men employed by two Midland firms would be called out for a week. The number of members of the Union on " indefinite " strike (said to be 1,800) would be substantially increased.

Supply Engineers' Salaries

As reported in our last issue, the British Electricity Authority considered at its meeting on Thursday last week the request of the Electrical Power Engineers' Association for a direct meeting with members of the Authority to discuss the Association's claim for a substantial improvement in the status and salaries of electricity supply engineers and technologists.

The Authority agreed that a special meeting of its Labour Relations Committee should be called, for Wednesday next (24th February), with Lord Citrine in the chair, to hear the Association's representations.

Contract Price Formulæ

The British Electrical and Allied Manufacturers' Association has issued the figures for its contract price adjustment formulæ. In each case the rate of pay for adult male labour at 13th February is deemed to be 141s 6d. The " cost of material " figures are:—

For electrical machinery and equipment the Board of Trade index figure published on 13th February is 156·3.

For turbo-generating and allied plant: materials used in mechanical engineering industries, 147·1, blast furnaces and iron and steel smelting and rolling (40 and 41), 143·1, price of ¾in o/d 18 s.w.g. brass condenser tubes (*Metal Bulletin*, 12th February), 3s 4⅛d per lb. Outstanding contracts covered by the B.O.T. intermediate products index the index figure for intermediate products (13th February) is 350·5.

Welding Demonstration

Meritus (Barnet), Ltd., 36, Wood Street, Barnet, is holding a series of monthly demonstrations of resistance welding at its works to which all interested persons are invited. The first demonstration will take place on 13th March.

Prices of Materials

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM Ingots	ton £156 os od
COPPER, H.C. Electro	ton £232 10s od
Fire Refined 99·70%	ton £231 os od
Fire Refined 99·50%	ton £230 os od
COPPER Tubes ..	lb 2s 3½d
Sheet	ton £290 os od
H.C. wire and strip	ton £261 10s od
LEAD, English ..	ton £81 15s od
Foreign	ton £80 os od
MERCURY	flask £63 10s od
TIN, block (English) ..	ton £660 os od
ZINC, G.O.B. Foreign	ton £70 os od
Electrolytic	ton £71 10s od
BRASS Tubes (solid drawn)	lb 1s 10½d
Sheet	ton £235 15s od
Wire	lb 2s 5½d
PHOSPHOR BRONZE Wire	lb 3s 8d
PLATINUM	oz £30 os od
RUBBER, No. 1 R.S.S. spot	lb 16⅝d–16⅞d

Radio-Telephony on Aerodromes

A contract valued at £70,000 for radio-telephone equipment to be used on R.A.F. aerodromes under Air Ministry jurisdiction has been given to Pye, Ltd. The installation of the two-way v.h.f. equipment will mark an important step forward in the security arrangements taken on the landing and take-off of aircraft. Fire-fighting vehicles, ambulances and control towers will now be able to maintain immediate and continuous contact between rescue squads in the event of crash landings. One of the first airfields to be equipped with the ground control equipment under this contract is White Waltham, Berks.

Import and Export Licensing

The Board of Trade announces the introduction of a consolidated Notice to Importers (No. 635) bringing up to date the summary of import licensing arrangements. It can be obtained from the Import Licensing Branch, Board of Trade, 43, Marsham Street, London, S.W.1. The Board also announces the introduction of a consolidated Order

governing export licensing arrangements. It is the Export of Goods (Control) (Consolidation) Order, 1954, which came into operation on 8th February. Copies of the Order (S.I. 1954 No. 118) are obtainable from H.M. Stationery Office, price 1s 9d.

No changes are made in the existing regulations for imports and exports by these documents. They set out the existing licensing arrangements in a convenient form.

Anglo-Russian Trade Talks

Reports from Moscow last week suggested that hard bargaining was proceeding between Russian trade organizations and members of the delegation of British industrialists visiting Russia. It was stated that for some plant the Soviet representatives were unwilling to go above 1950 prices in spite of the rise in most costs since that time. Among the equipment specifically mentioned in the reports were presses, machine tools, diesel generating sets and shunting locomotives.

Further groups of industrialists in this country are also visiting Moscow; among the companies mentioned are the International Combustion, Ltd., group, the Metropolitan-Vickers Electrical Export Co., Ltd., the English Electric Co., Ltd., and Babcock & Wilcox, Ltd.

The delegates from International Combustion, Ltd., Aberdare Cables, Ltd., and South Wales Switchgear, Ltd., left for Moscow last week. Aberdare Cables completed in December last an order for a large amount of h.v. cable which was placed in Moscow during a previous visit of the company's representative in July.

Mr. C. D. MacQuaide, a director of R. A. Lister & Co., Ltd., is reported by *The Times* as having said in Moscow last week that he had signed a provisional contract for the supply of ninety 410 kW diesel generating sets at a price exceeding a million pounds. A *Reuter* dispatch from Moscow attributed to Mr. J. B. Scott, the leader of the delegation, a statement that his company (Crompton Parkinson, Ltd.) had had an inquiry for 1,000 substations each worth about £2,000.

Dublin to Sligo Telephone Cable

On 1st February work began on the Irish national telephone network of underground cables to supplement and replace the existing overhead trunk pole routes which were becoming loaded to capacity. The first stage of this scheme covered a network of coaxial telephone cables, capable of affording up to 600 circuits per pair of conductors linking Dublin with Cork and Waterford and Athlone in the principal towns in the south. This was followed by a similar coaxial cable link with Drogheda, Dundalk and Belfast. The third stage of the development, for which contracts have recently been placed, covers the coast-to-coast route, Dublin to Sligo. On completion, this will represent the greater part of the projected national trunk system aiming at a country-wide no-delay service.

The latest type of coaxial cable used for this project will contain two tubes, except for a short distance where the spur route from Mullingar to Athlone follows the main route to Sligo, which will be made up of four-tube coaxial cable. The two-tube coaxial cable now has a potential capacity of 960 telephone circuits but will initially be equipped to meet present trunk requirements only. This carrier telephone system will include through dialling facilities to all parts of the national network. In addition to the coaxial tubes, the cable will contain two special screened circuits for high quality broadcast programme transmission and other conductors to meet telephone requirements at smaller towns which do not warrant access to the main coaxial system. Power for intermediate repeater stations will be fed through the coaxial tubes. The contract for the new cable and all associated carrier telephone equipment has been awarded to the Dublin branch of Standard Telephones & Cables, Ltd.

A section of the exhibition for architects, builders, etc., arranged by the Surrey Sub-Area, South Eastern Electricity Board

Electrical Wholesalers

Preliminary figures derived from the 1950 Census of Distribution and Other Services, announced by the Board of Trade, show that the number of wholesale establishments dealing with electrical goods in 1950 was 1,282. These employed 23,652 people (including working proprietors), had total sales of £132·7 million and paid £45·4 million in wages and salaries.

Architects' Conference

A three-day exhibition and conference was staged by the Surrey Sub-Area of the South Eastern Electricity Board from 3rd to 5th February. Invitations sent to all local authority surveyors, architects and housing managers, and private architects in the Sub-Area resulted in a good attendance, particularly on the first day when about fifty local authority representatives attended a talk on "Electricity in new Houses," by Mr. S. F. Osborne, the Surrey commercial officer, and later visited the exhibition. The exhibition was arranged to show how to reduce wiring and installation costs in new houses, the correct planning of water heating installations and installation of rising mains for multi-storey flats. Other exhibits included consumers' control units, "Ductube" and other new methods of cable installation, and a stand devoted to "Seeboard" and E.D.A. testing facilities for electrical appliances and materials. A demonstration unit showing the causes and effects of "smog" was supplied by the Meteorological Office.

Atomic Energy Bill

The Atomic Energy Authority Bill introduced into the House of Commons by Sir David Eccles last week is designed to create the United Kingdom Atomic Energy Authority consisting of a chairman and not fewer than six or more than ten other members.

Powers now exercised by the Lord President of the Council to produce, use and dispose of atomic energy, etc., are to be transferred to the new Authority. Certain powers and duties are, however, to be left with the Lord President. The relations between the Minister of Supply and the Authority are defined in respect of atomic weapon production. Among other provisions is one regulating the disposal of radioactive waste.

Funds already provided to the Lord President will be employed for the Authority's expenses; any additional expenditure will be very small.

Istanbul Trolley-bus Proposal

It is reported in the *Monthly Trade Journal* of the British Chamber of Commerce of Turkey that a commission formed by the Istanbul Electricity, Tramways and Tunnel Administration has recently prepared a report advocating the use of trolley-buses in Istanbul. The report has been sent to the Ministry of Public Works for approval and when this is forthcoming the necessary work and orders for the

vehicles will be put in hand without delay.

The *Journal* says:—" It is generally agreed that the trolley-bus network in Ankara is a successful venture and the use of such vehicles in Istanbul may well do much to relieve the congestion for which the streets of this old city are becoming renowned."

Catering Equipment Exhibition

Many visitors to the recent Hotel, Restaurant and Catering Exhibition held at Olympia were unable to see much of the equipment demonstrated owing to the electricians' strike, which deprived some of the stands of an electricity supply. An opportunity of seeing some of this equipment in operation is now provided by a comprehensive exhibition at the Service Centre of the London Electricity Board at 112, Victoria Street, S.W.1, where most of the apparatus is connected up for demonstration purposes.

Within the area covered by the Centre there are approximately 750 hotels, restaurants and guest houses, a large number of which are small establishments. The display, therefore, largely consists of equipment suitable for small scale catering and covers most of the classes of equipment now available. Many establishments now prepare and cook food in full view of customers and the exterior finish of equipment in such cases is of importance. In arranging the display, therefore, particular attention has been paid to equipment with a finish that catches the eye. In order to direct the attention of passers-by to the exhibition, the show windows of the Centre are equipped with selected apparatus. The exhibition, which opened last week, will continue for a month.

Underwater Cable for Canada

In our last week's report of the $3,000,000 contract received by British Insulated Callender's Cables, Ltd., Mr. W. H. McFadzean and Mr. D. T. Hollingsworth were referred to as being on the left and right of the photograph; this should have read " right and left."

Houses for Skilled Workers

A report has been presented to the Liverpool City Council on the need for housing accommodation for skilled workers at the East Lancashire Road Works of D. Napier & Son, Ltd., and the English Electric Co., Ltd., where 9,000 persons are employed. Mr. F. R. Smith, director of the English Electric Export Co., Ltd., and local general manager of the two companies, informed the city architect that half a million pounds had recently been expended for the erection of a large new building for the manufacture of switchgear and transformers, quite apart from a large sum expended on the machinery and equipment. The bringing into operation of this new works and expansion to full employment would depend jointly upon the securing of adequate export orders and their ability to recruit certain kinds of key workers including designers and draughtsmen as and when necessary. Napiers also had tooled up the factory to produce large numbers of the new " Deltic " diesel engines. Key workers' houses were needed on terms comparable with those offered by other companies which were competing for the same class of skilled men.

The issue was whether or not an increase of employment by the firm should be assisted by the provision of housing accommodation for skilled workers recruited from outside the city, as against the effect which such an arrangement would have upon the general housing situation which the City Council faced.

Post Office Engineers' Claim

At a Press conference held in London last week, Mr. C. Smith, general secretary of the Post Office Engineers' Union, gave a summary of the Union's case, which has been submitted to the Post Office, in support of its " value of work " pay claim which affects 55,000 members. He said that the Union was seeking increases ranging from 10s to £2 a week, and its claim was an attempt to put Post Office engineering grades in their proper place in the general pay scheme of the Civil Service and of the country.

Polythene Disintegration

It has been noticed that chlorinated hydrocarbon insecticides such as Gammexane and D.D.T. powders when brought into contact with some grades of polythene under exceptional conditions such as imposed by the Bell Telephone Laboratories environmental cracking test (see " Environmental Cracking of Stressed Polythene " by De Coste, Malm and Wallder, Bell Telephone Laboratories, Inc.) cause the polythene to disintegrate. This phenomenon applies particularly to polythene of grades 7 and softer. The test is an extremely severe one and the phenomenon has not been observed where polythene insulated cable has been treated with these insecticides. It would be interesting to know whether cable users in the tropics have experienced any trouble with polythene-insulated cables which may have come into contact with insecticides of this type.

Works Visit

The Earl of Home, Minister of State for Scottish Affairs, visited the Alloa works of the Harland Engineering Co., Ltd., on 21st January and during his tour of the works he saw different stages in the manufacture of large high speed boiler feed pump sets which are being produced for the British Electricity Authority and for generating stations abroad. He also saw water turbines and water turbine driven alternators under construction, destined for power stations in Scotland, Kenya and Australia. The Minister was especially interested in motor generator sets and d.c. motors being made for sectional electric drives for paper and board mills in Great Britain, Canada, Finland, New Zealand and Mexico. Lord Home was conducted on his tour of the works by Mr. K. W. Atchley, works director.

A Lecture Tour

On 4th February Mr. R. J. Fothergill, B.Sc., North-East England area engineer of the Lighting Service Bureau, and Mr. R. L. C. Tate, F.R.S.A., the London Bureau shop lighting specialist, adopted a novel means of talking about shop lighting to a meeting of the Electrical Contractors' Association in Newcastle-upon-Tyne. Motor coaches were hired and the audience was taken on a tour of Newcastle. At each interesting installation Messrs. Tate and Fothergill got out and armed with " walkie-talkie " apparatus described the lighting to the audience in the coaches, who heard their commentaries relayed through loud speakers. Some fifty electrical contractors took part in this experiment.

Salvaged Airmail Order

An airmail letter salvaged from the wreckage of the " Comet " airliner which crashed in the Mediterranean last month has been received by Gent & Co., Ltd., Leicester. The letter, which was posted in Burma by the company's agents, and was still decipherable, asked for a quotation for a large clock for the outside of an office block on the Rangoon river front.

E.D.A. Sales Conference

The provisional programme has been drawn up for the 1954 E.D.A. Sales and Service Conference which will be held in London from 6th to 9th April. As in former years, Caxton Hall, Westminster, will be the meeting place for the first three days, and on Friday, the delegates will assemble at the Connaught Rooms, Great Queen Street, for general discussion, followed by the Conference luncheon.

The Conference will be opened by Sir Henry Self, deputy chairman of the British Electricity Authority and president of E.D.A. He will be followed by Mr. J. Gogan, chief commercial officer, South West Scotland Electricity Board, who will speak on the " Organization of Sales and Service to the Consumer." At the afternoon session Mr. R. E. Gamlen, section head (commercial), South Eastern Electricity Board, will deal with " Selling Electricity: Some Economic Considerations," and in the evening there will be a programme of films. On Wednesday morning " Training Commercial Staff " will be the subject of a paper by Dr. A. G. Beverstock, education and training officer, Southern Electricity Board, supported by Mr. W. B.

Poulter, chief commercial officer, Southern Electricity Board. In the afternoon Mr. J. W. Moule, chief commercial officer, South East Scotland Electricity Board, will speak on "Electric Floor Warming."

Thursday morning's paper will be by Mr. J. R. Anderson, commercial officer, Birmingham Sub-Area, Midlands Electricity Board, whose subject will be "Electricity for Productivity: Selling the Idea to the Industrialist." In the afternoon a paper on "The Scope of Electronics in Industry" will be given by Mr. W. P. Warren, section head, industrial supplies, South Wales Electricity Board.

Farm Lighting

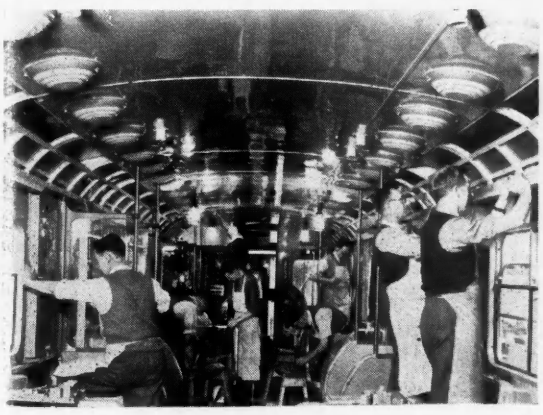
The latest in the series of farm electrification illustrated broadsheets published by the Electrical Development Association, is "Farm Lighting."

With the aid of a humorous drawing of a milking scene, the broadsheet opens by pointing out that milking is only one of the many farming jobs for which proper lighting is essential to prevent mistakes and waste of time. The unique flexibility of control and the wide variety of lamps designed for farm purposes make electricity ideal for farm lighting. There are five sections to the broadsheet giving brief details on the need for light, how electricity can help, lighting equipment, design and installation, and cost of electric lighting. Copies of this broadsheet (E.D.A. 1748) can be obtained from the Association at 2, Savoy Hill, London, W.C.2.

Coaches for Toronto Underground

The last four coaches were shipped from Avonmouth on 16th February, in the Canadian Pacific freighter *Beaverburn*, for the new underground railway in Toronto. The contract for 100 coaches was secured by the Gloucester Railway Carriage & Wagon Co., in competition with American and Canadian builders. The value was $8,000,000. The railway, known as a "rapid transit line," is to open its public service on 30th March. It has taken four years to build and cost $58½ million. The original order was for 104 coaches but it was later decided to experiment with all-aluminium coaches and four of this type are now under construction for shipment later this year.

Work in progress at the works of the Gloucester Railway Carriage & Wagon Co. on one of the coaches for the new Toronto subway



Brush Apprenticeship Schemes

The Brush Electrical Engineering Co., Ltd., has issued a new booklet giving up-to-date details of its apprenticeship schemes.

Electrical Sub-Contract Dispute

The *East Anglian Daily Times* reports a judgment in favour of a Felixstowe firm of builders for £253 and costs against the East Suffolk County Council in respect of electrical work at a school.

The case was dealt with by the Lord Chief Justice who, in giving his judgment, said that a clause in the building contract provided for the electrical work to be done by sub-contractors and a provisional sum was inserted for the work. The builders (Rogers Bros., Ltd.) placed the work with electrical contractors but before it was completed those contractors went into liquidation and the work was transferred to another firm. The plaintiffs had paid this firm but the amount was £253 in excess of the provisional sum and the County Council contended that it was not liable for the excess payment.

His Lordship said that the actual cost of the work had to be substituted for the provisional sum and as the builders had followed the instructions of the architect when there was a change in electrical sub-contractors they were entitled to receive the payment they had made.

Canadian Price Fixing Allegation

Our Montreal Correspondent reports that the Canadian Government has decided to press price-fixing charges against certain electrical wire and cable manufacturing concerns. Ten companies were named in a combines report last November which charged them with making a "mockery" of competitive tenders. Announcing this move in the Canadian House of Commons, the Minister of Justice said that the exact parties to be prosecuted would be determined later when evidence was examined in preparation for trial.

The combines inquiry began in 1952 when the Government received complaints by local hydro groups that firms were making identical and non-competitive bids on tenders for electrical equipment. Special Combines Commissioner H. Carl Goldenberg, in naming ten companies—virtually the entire industry—said the alleged combine had been established for some 41 years. He contended that the companies, by agreeing and arranging to submit identical bids on tenders, had vitiated and made a mockery of the system of competitive bidding which had long been established for the express purpose of protecting the public interest. He said the evidence showed that the companies tried to conceal their price-fixing arrangements and made an attempt to disguise the fact that net prices were identical. The companies named in the report were the Northern Electric Co., Ltd., Phillips Electrical Works, Ltd., Automatic Electric (Canada), Ltd., the Canada Wire & Cable Co., Ltd., Canadian General Electric Co., Ltd., Cables, Conduits & Fittings, Ltd., Federal Wire & Cable Co., Ltd., Triangle Conduit & Cable (Canada), Ltd., Boston Insulated Wire & Cable Co., Ltd., and Industrial Wire & Cable, Ltd. Mr. Goldenberg said the industry's "big four," Northern Electric, Phillips, Canada Wire & Cable and Canadian General Electric, played major roles in the alleged combine to maintain prices. The others participated to lesser degrees.

Trade Announcement

The works, sales department and offices of **Saxon Components, Ltd.**, are now at Star Works, 177, Kingsland Road, London, E.2 (telephone: Clerkenwell 8977).

Catalogues and Lists

Isopad, Ltd., 30–32, Rosemont Road, London, N.W.3.—Illustrated folder on "Isodrum" heaters — electric heating mantles for the handling of viscous materials.

British Thomson-Houston Co., Ltd., Crown House, Aldwych, London, W.C.2. —"Mazda" lamp catalogue—a 56-page indexed book covering the range of the company's photographic, fluorescent, decorative and discharge lamps, etc.

Grey & Marten, Ltd., City Lead Works, Southwark Bridge, London, S.E.1. —Five technical publications dealing with soft soldering, soft soldering of aluminium, amalgam fusible alloys, amalgam bearing metals, and silver soldering and brazing.

Simplex Electric Co., Ltd., Broadwell, Oldbury, Birmingham.—Specification sheet dealing with the Creda "Contour" storage type water heater.

Visco Engineering Co., Ltd., Stafford Road, Croydon.—Technical publication dealing with the company's new patent "Reciprojet" self-cleaning air filter (541).

Unity Heating, Ltd., Chilworth Manor, near Southampton. — "Unity Heating Manual," a 52-page booklet including useful tables and data; and an illustrated catalogue of the company's range of convectors, tubular heaters, unit heaters, etc.

Linolite, Ltd., 118, Baker Street, London, W.1.—Priced leaflet on "Linolite" electric light fittings, strip reflectors and signs (16A).

Electricity on the Farm

Discussions at Last Week's Conference at Cheltenham

APPLICATIONS of electricity to farming were well to the fore in discussions at the fourth National Power Farming Conference arranged by the *Power Farmer* at Cheltenham last week. Particularly interesting was the diversity of views expressed on the paper on " Grain Handling and Storage " presented by Mr. Rex Paterson, a farmer from Hampshire. Mr. Paterson declared that, in spite of the fact that he was entering his fourteenth combine harvest, he had little in the way of drying facilities. He had not the conveyors and bins which many thought essential for storage. On his farm he grew mainly Scandinavian barleys and Atle wheat. These barleys were almost invariably dry, often at only 14 to 16 per cent moisture content, while the wheat was either sold with a high moisture content or taken to his two remaining dryers which were ample to serve his own seven farms and those of many neighbours.

Ample cleaning capacity was important. The dry grain was sometimes sacked but preferably blown from the dryer to an overhead 20 ton bin. When it could not be cleared fast enough it was taken by tractor for storage in any suitable concrete-floored building available, where it remained until there was a market. This method had been tried only for one season but he thought it was better than bins and all the necessary conveyors and elevators. Grain had been stored on concrete floors for more than ten years to a depth of 6 and 8ft, generally at about 15 per cent moisture content. Reloading of the grain off the floor was still something of an unsolved problem.

Grain Handling in Wet Seasons

Opening the discussion, Mr. Martin Harvey (Midlands Electricity Board) pointed out that there were certain parts of the British Isles where only specific kinds of cereals could be grown and he would have liked Mr. Paterson to have given advice to the West of England and Welsh farmers, who in many of the harvest years, such as the last one, had to combine grain at up to 25 per cent moisture content. On one West Midlands farm where harvesting started early in August and finished a month later, over 5 per cent moisture had to be removed on an average to ensure safe storage.

Mr. Harvey agreed that one could not be dogmatic as to types of dryers. On very large farms a continuous direct type dryer of several tons per hour throughput might be required, the crop being stored in bins or on the granary floor. To deal with very wet grain a smaller direct heated dryer might be used, the low moisture content grain being dealt with in the ventilated bin type of dryer. A number of successful ventilated in-bin dryers were now in use in the West Midlands, an area which was regarded as doubtful for such equipment a few years ago. He thought this was a good method for farms producing 150–300 tons per year.

For the smaller farmer the all-electric platform or in-sack dryer might provide the solution of the problem. The platform dryer could also earn its keep at other times of the year as a warmed air bag dryer, provided that a dual speed fan was fitted. A Worcester farmer with a 32 sack platform dryer had successfully dried a quantity of second-cut hay, which had a remarkable green colour: 30 cwt was dealt with in 20 hours at a cost of about £1 1s per ton, but the farmer considered that if it had cost £5 per ton it would still have been worth while. Wet potatoes could also be dried off on the platform dryer.

Five points were essential for successful in-bin drying: (1) Ample combine capacity to take advantage of the weather. (2) A good precleaner. (3) A conveying system of ample capacity to load the grain and transfer it from bin to bin. (4) Ample ventilating fan capacity to give a velocity of 15 ft/min over the total floor area of three-quarters of the number of bins at once, the fans working against a 6 lb/sq in back pressure. (5) Stepped control electric heaters giving a 10–12 deg F temperature rise.

In reply to a query by Mr. P. G. Finn-Kelcey (E.R.A.), Mr. Paterson said that the proportion of grain which had to be dried depended on the season. Last year, the worst they had ever had, none of the Ymer barley, about half the Harta barley and all the wheat needed drying. Mr. Randall (Wiltshire) thought there was a strong case for positive drying for over 60 acres of grain. The question of drying small seeds such as mustard was raised by Mr. Johnson (Lincolnshire) and Mr. Paterson suggested mixing other larger seeds with them.

On the matter of costs of drying plant, Mr. Paterson said that for a 20 sack platform dryer constructed by the farmer himself the cost might be as low as £105. A 100 ton in-silo installation, utilizing an existing building with new bins, conveyors, elevators, etc., would cost about £1,200 with all paid labour. A 220 ton unit with a Dutch barn would come to just under £3,000.

Mr. R. A. Bayetto (E.D.A.) thought that the paper had been coloured by the big farmer's outlook and that the suggestions made did not meet the grain drying requirements of the small farmer. He drew attention to an E.R.A. development in which a two-storey building was used. Part of the floor on the upper storey was removed and an expanded metal tray substituted, a normal electric grain drying unit being placed beneath. The grain could be stored on the floor as Mr. Paterson suggested.

Barn Hay Drying

One of three papers on " Harvesting Protein from Grass " dealt with " Barn Hay Drying." The author, Mr. W. L. Hearle (North Western Electricity Board), said that satisfactory results achieved by dairy farmers in Lancashire, Cheshire and the West Riding during recent years had further established that it was both possible and practicable to dry well pre-wilted grass by cold air ventilating in the barn. This was particularly significant as these are as experienced high relative humidities and rainfall.

The moisture content of the grass should normally be reduced to 50 per cent in the shortest possible time. This necessitated intensive turning and tedding immediately after cutting. The grass should then be loaded into the drying barn to a depth of about 8ft and built up to 12–14ft by successive cuttings at 2–4 day intervals. The fan or fans were left running continuously until the whole mass of grass was dry enough for baling or removal for storage elsewhere. The drying time varied between ten and twenty days. Sometimes three complete loadings of the barn could be made in a season.

The cost of the equipment would vary with the floor area involved but taking 325 sq ft as a typical size of single-bay installation the complete capital cost would be about £170—£100 for the fan, £40 for building alterations and £30 for the electrical installation. The operating costs for the fan on plants running in the North West since 1950 had varied between 10s and 25s per ton. Labour costs could usually be taken as practically the same as for normal hay making. The type of fan used was governed by the floor area and depth of loading: motors varied between 3 h.p. and 8 h.p.

The same equipment could be used for grain drying. Corn from the sheaf could be loaded straight from the binder and stacked on the drying floor to the full height of the barn. Continuous blowing of cold air would dry corn very much more quickly than hay, but heating elements were usually necessary where considerable quantities of combined grain had to be dried fairly quickly.

Mechanization in Germany

Speaking on "Problems of Mechanization in German Agriculture," Dr. Walter Schaefer-Fehnert (Gottingen University) said that, while the areas and populations of Western Germany and the United Kingdom were nearly the same, the average farm size in Western Germany was only 20 acres compared with 90 acres here. This difference was the most important factor concerning all questions of mechanization. Since electricity was made available to agriculture during the 1920's and since most large farms owned electric threshing machines the combine was not of importance in Germany, especially as electricity was cheaper than tractor power. Manpower scarcity and technical improvements in harvesting straw, to which the German farmer attached great importance, had, however, encouraged large farms to buy combines. Accordingly the number of combines had doubled since 1952 and last harvest there were 2,500 in use. But this was still a modest number compared with the 400,000 electric threshers in use.

Opening the discussion on Mr. P. G. Finn-Kelcey's paper on "Research on Electricity in Agriculture" (reported in our last week's issue), Mr. J. L. Barton, a Suffolk farmer, put forward a plea either for three-phase supplies or cheaper single-phase motors, which now cost about half as much again as three-phase units. He also referred to the use of infra-red lamps which he had found to reduce mortality of young pigs by one and a half pigs per sow; he had also used them successfully for calves. Mr. Finn-Kelcey in reply said that the question of cheaper single-phase motors was being followed up actively by manufacturers. On the subject of driving electric tractors other than by cable he mentioned the use of diesel engine driven generators on combines.

Replying to a question by Mr. Hearle on hay drying costs, Mr. Finn-Kelcey said that in an experimental installation in Worcestershire the cost per ton amounted to £3, including depreciation, labour and 14s 2d for electricity for driving the fan and pneumatic elevator. On single-phase motor designs, he said that while the weight would never be as low as for three-phase machines, developments in hand would bring about very considerable reductions.

Mr. J. T. Taylor (British Thomson-Houston Co.) thought too much emphasis had been placed on the extra cost of the single-phase motor. Up to 3 h.p. its lower installation costs balanced the lower capital cost of the three-phase motor. A tendency to reduce costs at the expense of safety should be resisted by manufacturers and farmers. Electricity could be lethal unless it was correctly installed and due attention paid to safety requirements.

LETTERS TO THE EDITOR

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

De-freezing Pipes Electrically

TROUBLE with water pipes in the recent severe cold spell recalls an experience early in 1929 when my company was to have an official test of electric seam welding plant for 40-gallon steel drums. Officials of a Spanish company were to arrive for this demonstration when, to our dismay, we found the water main that morning was frozen inside the works so that no water was available.

An adequate supply was essential to cool the electrodes of the seam welders during the test and so, as a last resort, I ran a 100ft cable from the l.v. secondary coil of the welding machine to the entry point of the water main and made the other connection to the steel water pipe near the welding plant.

Much to my surprise, after some 15 minutes, the main thawed, although no perceptible temperature rise was noticeable in the steel pipe itself. As the thawing of the pipe was carried out by a low voltage a.c. supply, no electrolytic action to the pipe took place. I was reminded of this incident last week when a former employee, remembering this device, applied it to a frozen main at a large concrete works with quickly successful results.

Willesden Junction, N.W.10. WYATT MEACHER, M.I.E.E. (Westminster Engineering Co., Ltd.)

ENGINEERS AS MANAGERS

THE reasons for the diminishing part taken by engineers in the management of engineering enterprises were explored by Mr. H. Bainbridge in a paper which he read last Tuesday at a meeting of the Association of Supervising Electrical Engineers. He also made suggestions for improving the position from the engineer's point of view.

In the early history of the engineering industry progress was attributable to the genius, energy and enterprise of craftsmen who built up and controlled their businesses. Now management had become too complicated and had fallen into the hands of professional managers—accountants, lawyers, salesmen, economists and so on—and the engineer still occupied "a lowly position in the social scale."

Mr. Bainbridge believed this to be the result of the narrowness of the engineer's education; his exclusive absorption by technical studies cut him off from the broad current of intellectual movement enjoyed by members of other professions. Moreover this exclusiveness accounted for a lack of that commercial ability which was essential to successful management. A good general manager, or managing director, was rarely a specialist; he was a man of broad experience with a sound understanding of the basic principles of the business.

It was the task of engineers to convince the owners of the industry that, as engineers, they were the best fitted to manage the business of engineering; they must devise a system of fitting themselves for management which combined sound practical, technical and commercial training with a reasonable standard of general education; and they must work for organizations which embodied an easily recognized ladder of advancement from the shop floor to the highest office of management. Mr. Bainbridge put forward a number of suggestions by which these aims might be achieved. The training of student apprentices and university apprentices in foremanship, with periods in all departments, while keeping in close touch with the works, was outlined.

Engineering in Europe

Abstracts from Foreign Technical Journals

THE basic facts of power factor improvement, including the determination of the capacitor rating for a certain increase of cos ϕ, and also the relative advantages of individual, group or centralized compensation, depending on the number and character of the consuming devices, are fairly general knowledge. The spreading use of series and parallel capacitor banks in high-, medium- and low-voltage systems has forced the industry not only to develop capacitor design and construction of units and banks to a high degree of safety and reliability in operation, but also to concentrate on the special problems connected with the throwing on and off of the banks. Hence the special switchgear and the protection of capacitors and systems against the dangers arising from switching surges which are in this case very real.

As the amplitudes of switching transients depend not only on system parameters, position of capacitor banks and on the reactances of the neighbouring system elements, e.g., transformers, but also on the breaker characteristics, damping resistances and reactors have to be designed very carefully, since not only the fundamentals, but also the harmonics of the composite oscillation frequencies produced may be dangerously amplified by resonances. A number of solutions of interesting cases by Siemens are discussed theoretically and the plants and their auxiliaries described and shown in pictures in "Power Factor Improvement by Capacitors," W. Kafka and H. Reizuch, *Siemens Z.*, Vol. 27, No. 5, pp. 258–264, 1953, in German.

Synchronous Generator Stability

The regulation of the excitation of a generator according to stator voltage or current, or to rotor displacement angle, combined with regulation according to the first two derivatives of the displacement angle of the rotor is an efficient means of improving static stability of the generator. The basic regulation must take into account the operating conditions, static characteristics of voltage and output of the generator. The additional regulation according to the first two derivatives of displacement angle then ensures static stability for all possible conditions in power transmission, on the condition that the basic regulation ensures that the free term in the characteristic equation of the system remains positive.

In some cases regulation according to the second derivative of rotor displacement will suffice, i.e., according to rotor acceleration. If the field system of a generator contains two inertia elements of the first order (e.g., exciter machine and sub-exciter), the regulation factors permissible with regard to stability have upper and lower limits; if it has only one inertia element (thus no sub-exciter, or inertia-free exciter controlled by inertia governor), the regulation factors according to rotor acceleration have only a lower limit; factors according to rotor speed have still upper *and* lower limits.

For a certain choice of regulation factors according to deviation and derivatives of displacement angle the constancy of the direct-axis flux linkages for given initial conditions is assured (standardized regulation). In order to assure this constancy under any other operating conditions, regulator setting (i.e., regulation factors) must be changed. If the field system contains only one inertia element of the first kind, it is possible by suitable choice of regulation factors (according to deviation, speed and acceleration) to obtain increase of flux linkages proportional to angular displacement.

The investigation method based on the delineation of the stability zone in the plane of the regulation factors according to the stability permits of obtaining sufficient data for a preliminary choice of regulation factors and setting of field regulators. Calculation of the standardized regulation factors and determination of the position of the stability zone relative to the point corresponding to the standardized factors enables, in the majority of cases, the permissible regulation factors assuring stable operation to be found with comparative ease and speed. Upon the whole, the method fairly exhausts the possibilities offered by additional regulation according to slip and rotor displacement.—"Improvement of the Stability of a Synchronous Generator by Regulating the Excitation according to Slip and Rotor Acceleration," P. I. Zubkov and V. I. Gorushkin, *Izvestiya Akad. Nauk* (*Otdel. tekh. Nauk*), No. 9, pp. 1262–1281, 1953, in Russian.

Carrier-Frequency Communications

The author outlines post-war developments in carrier-frequency engineering as influenced by the increasing interconnection of power systems and in the light of practical experience and economic considerations. Neither cable systems nor interconnected medium-voltage systems are suitable for carrier-frequency communications; between 30 and 60 kV it will always be necessary to compare estimates for the erection and operation of separate telephone lines with those of c.f. communication. Above 60 kV c.f. communication will always be the most satisfactory solution.

Elements which need to be very carefully designed are the coupling circuits, filters and capacitors, several variants of which are shown in diagrams and pictures, as well as the wave traps for the high operating currents to be considered. The danger of a shortage of communications channels which may arise in large interconnected systems may be obviated by a division of the system into smaller sub-systems for communications purposes only. This is achieved by decoupling circuits, at either side of which the same carrier frequency may be used.

The problems of telephony, telemetering and telecontrol transmission channels are different, which fact is illustrated by the different types and systems of transmitting and receiving apparatus used for these different purposes. Further questions discussed are relative merits of single and double side-band operation, multi-purpose equipment and the superposition of speech and pulse-frequency bands.—"Use of Carrier-Frequency Communications Equipment in H.V. Systems," H. K. Podszeck, *Siemens Z.*, Vol. 27, No. 6, pp. 337–342, September, 1953, in German.

Readers who require accurate full translations of any of the articles abstracted in this section can be put into touch with the translators who will supply them at current rates.—Editors, *Electrical Review*.

Higher Output in January

LAST MONTH, when a record load of 15·7 million kW was carried by the British Electricity Authority, the total amount of electricity generated by the Authority and the North of Scotland Hydro-Electric Board was 7·8 per cent more than in January, 1953. This compares with an increase of only 0·1 per cent in December, the difference being largely accounted for by the contrast in weather in the two months. The total installed capacity remained at 19,169 MW as at 31st December last.

ELECTRICITY GENERATED AND PLANT INSTALLED*

	Fuel consumed Thousand tons			kWh generated Millions			kWh sent out Millions	Installed capacity (m.c.r.) MW
	Coal	Coke and Breeze	Oil	Steam	Water power	Total†		
British Electricity Authority ..	3,818	105	16·8	6,914	49	6,974	6,566	18,602
N. of Scotland H.E.B. ..	20	1	1·3	31	112	148	147	567
Total for January, 1954	3,838	106	18·1	6,945	161	7,122	6,713	19,169
Corres. total for January, 1953	3,699	96	11·6	6,480	111	6,609	6,233	17,745
Increase or decrease, per cent	+3·8	+10·4	+56·0	+7·2	+45·0	+7·8	+7·7	+8·0

* Comprising all generating stations controlled by the British Electricity Authority and the North of Scotland Hydro-Electric Board.

† The total figure includes 10·7 million kWh generated by oil engines and 4·5 million kWh by waste heat plants in January, 1954.

Assisted Wiring

Metropolitan boroughs have decided to urge the London Electricity Board to re-introduce an assisted wiring scheme. The Metropolitan Boroughs' Standing Joint Committee reports that "an overwhelming majority" of its twenty-eight municipalities are in favour of such a scheme.

Scottish Service Centre

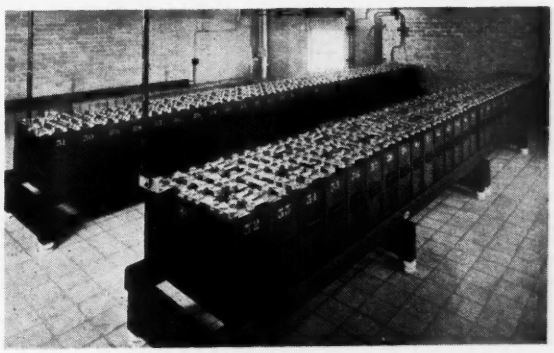
The South East Scotland Electricity Board has opened a new service centre in the Inch housing area on the outskirts of Edinburgh. The scheme will ultimately cover 4,000 houses and at present consists of approximately 2,000 houses. The service centre is situated in the planned shopping area for the scheme. Apart from the sale and demonstration of equipment, consumers can pay their electricity accounts there and the centre is equipped to deal with miscellaneous repairs of equipment.

Sutherland Supply Extension

Switching on the electricity supply to the Melvich area, Sutherland, recently, Mr. T. Lawrie, the general manager of the North of Scotland Hydro-Electric Board, said that the Board was ready to supply from the Melvich extension the considerable amount of electricity which would be required by the new atomic energy power station which it is expected would be established in Caithness. There was also to be an all-electric lighthouse in Strathy, the first lighthouse to be built in Britain for many years. Sir Hugh Mackenzie, deputy chairman of the Board, stated that the total cost of the line from Thurso to Melvich was £316,000. He expected that a start would be made, before another year had passed, on the Altnabreac peat utilization scheme, involving an experimental peat-burning station for generating electricity in Caithness.

Alkaline Battery at Keadby

An alkaline battery, which the company claims is the largest ever associated with electricity generating plant, has been installed by Nife Batteries, Redditch, in the new B.E.A. power station nearing completion at Keadby. Comprising 186 nickel cadmium cells, type LR44, with a capacity of 440 Ah, the battery will meet the loads imposed by six d.c. oil pump motors, by emergency lighting and switch closing. If the a.c. power supply should fail the total load on the battery imposed by all six d.c. pump motors would total 450 A for 20 minutes. The remaining loads on the battery consist of emergency lighting amounting to 80 A for a maximum period of 50 minutes and the electrical closing of switches requiring a solenoid current of 60 A. In an emergency, therefore, the total load could amount to as much as 590 A. In normal conditions the battery floats across a constant potential type mercury arc rectifier and is thus maintained in a fully charged state. Provision has been made for a manually controlled quick charge when necessary.



A battery of 186 "Nife" nickel cadmium cells installed in the battery room at Keadby

Shortage of Shillings

Shillings have been so scarce in certain parts of Monmouthshire recently that it is reported that housewives have been offering to buy them at 1s 6d each for their electricity meters. As a solution it was suggested at a meeting of the Monmouthshire Urban District Councils' Association that the Electricity Board should retain quantities of shillings in its area instead of banking them, or provide dual meters so that other coins could be used.

Stella South Power Station

It was reported at a meeting of Ryton-on-Tyne U.D.C. that some of the plant at the new Stella South power station, Ryton, would be in operation by the end of this year.

Washington (Durham) U.D.C. has approved plans by the British Electricity Authority for a 132 kV overhead line from Stella to Herrington Burn.

Wiring Plans

Warrington Watch Committee is to submit for approval a proposal for the rewiring of the Central Police Buildings at an estimated cost of £1,500.

South Shields Town Council is to spend £3,404 on the installation of

electricity in another 247 houses on the Cleadon Park estate.

The North Eastern Electricity Board has submitted to Gateshead Town Council a scheme for supplying electricity to 426 houses on the Wrekenton neighbourhood unit.

House Wiring Costs

Sunderland Town Council has negotiated an agreement with electrical contractors on prices to be paid for installing electricity in new houses. The cost will range from £21 18s 6d to £25 19s for bungalows and £23 18s 6d for 3 AI type houses.

Brighton Illuminations

Proposals submitted by the Borough engineer and surveyor of Brighton for the extension of the illuminations scheme for 1954 are estimated to cost an additional £4,250.

OVERSEAS

Snowy Mountains Project

The cost of the next major section of the Snowy Mountains hydro-electric project is likely to be within the estimate made by the Snowy Mountains Authority, says the chairman, Mr. W. Hudson, after studying a group of tenders. The stage covered by these was estimated in May last to cost £58,600,000, the works including a 14-mile tunnel under the Great Dividing Range, a concrete dam 290ft high on the Eucumbene River at Adaminaby, and an underground power station. These will increase Australian generating capacity by 13 per cent. It is stated, however, that because of the complex comparisons to be made, it will be some time before the contracts are allotted.

The conference to discuss the future of the Snowy Mountains scheme has been postponed indefinitely. The Minister for National Development (Senator Spooner) was to have met Victorian and New South Wales Ministers recently, but legal advisers had not completed a draft of an agreement which will deal with the payment of construction costs and distribution of power and water (at several conferences last year between Federal and State Ministers no agreement on these points was reached). Observers believe that if the States do not eventually ratify the agreement which is now being prepared, the Commonwealth is likely to proceed alone with the construction of the scheme.

American Output in 1953

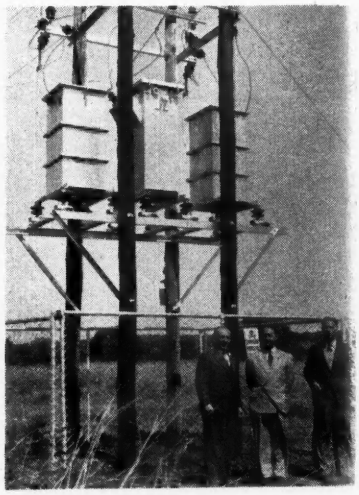
Mr. Walter H. Sammis, president of the Edison Electric Institute, has reported that in 1953 the output of the electricity supply industry of the United States reached a total of 442,000 million kWh, an increase of 43,000 million over the preceding year. In addition industrial and railway plants produced 71,000 million kWh, raising the total to 513,000 million kWh. The addition of 1·4 million new consumers brought the total to 49·9 million. Since electricity is now available to almost every American home, with 98 per cent of occupied homes enjoying electrical service, the growth in the number of consumers was attributable mainly to the construction of new homes.

An expansion of 186 kWh raised the annual average household consumption to 2,355 kWh, an amount more than double the average use nine years ago. Despite inflationary factors, the average revenue per kWh from domestic consumers fell from 2·77 cents in 1952 to 2·75 cents in 1953.

Electricity sales again reached a record total at 382,000 million kWh, 11·5 per cent more than in 1952 and double the 1946 figure. Industrial sales were 189,500 million kWh (13·2 per cent increase), residential sales 96,800 million (11·5 per cent) and commercial sales 68,200 million (9·9 per cent).

Generating plant with a capacity of 9,200 MW was installed during 1953 raising the total plant installed to 93,500 MW—about double the 1942 level. For the country as a whole the gross margin between plant capability and peak power demand was 13,500 MW or 17 per cent, against 8,850 MW (12 per cent) in 1952. An addition of 14,100 MW is planned for 1954.

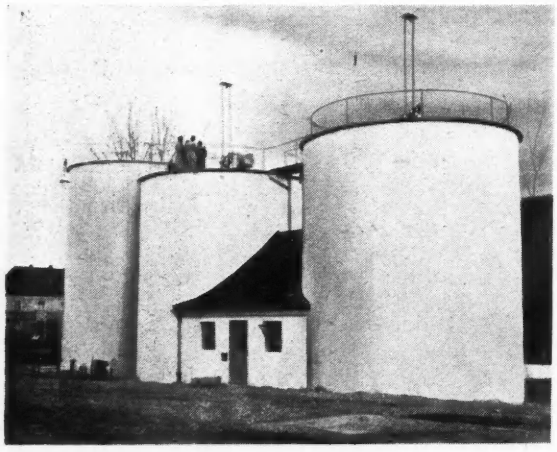
Increased efficiency reduced the coal consumption per kWh from 1·097 lb in 1952 to 1·065 lb last year.



An experimental series capacitor installation on one of the 11 kV lines of the Electricity Supply Commission of Southern Rhodesia serving the Umvukwes chrome mining area. The results obtained have so far been very satisfactory. In the photograph are Mr. Kerrich Walker, district engineer of the Commission, and Messrs. A. F. Coventry and L. L. Langton, of British Insulated Callender's Cables, Ltd.

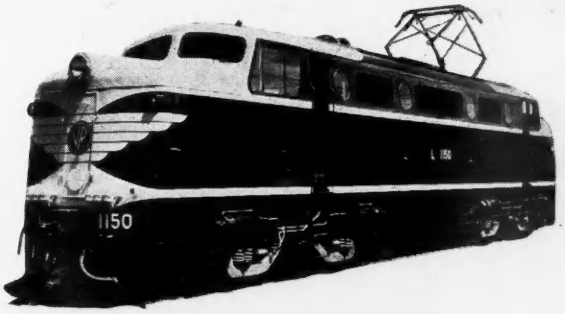
Trinidad Load Estimates

Revised estimates submitted by the general manager of the Trinidad and Tobago Electricity Commission, Mr. K. W. Finch, indicate that the m.d. on the system (14,240 kW in 1952) is likely to be trebled by 1960, while the annual electricity output is expected to rise from 61 million kWh to about four times that figure. Besides the well-known asphalt industry, Trinidad possesses oil wells, sugar factories, rum distilleries and other enterprises, and there is scope for considerable electrical development in the colony's agricultural industry. As reported in our issue of 30th October, 1953, a new power station has been put into operation in the south of the island to supplement the Commission's Port-of-Spain plant. In 1952 a total of 112 miles of overhead lines from 2·3 to 66 kV was erected, making altogether 580 miles with 10 miles of underground cables. A small electrification scheme was begun in Tobago. The number of consumers supplied by the Commission at the end of 1952 was 17,053, an increase of 2,454. In addition to the Commission's generating stations other plant in use aggregated 68,128 kW, including 51,388 kW of private plant operated by the oil industry.



The village of Moos, near Platting in South Germany, has its own generating plant, which cost 130,000 DM. The fuel used for the generators is a gas obtained from vegetable compost and manure

ELECTRIC LOCOMOTIVES FOR AUSTRALIA



RHEOSTATIC electric braking is a feature of the twenty-five 2,400 h.p. 1,500 V d.c. mixed traffic locomotives of the Co-Co type which are being built by the English Electric Co., Ltd., for service on the Gippsland main line of the Victorian Government Railways, Australia. In addition to the increased traffic capacity which will be made available as a result of greatly improved locomotive performance, a substantial reduction in costs of motive power operation and maintenance is indicated.

These 96 ton locomotives run on a 5ft 3in track with a maximum tractive effort (25 per cent adhesion) of 54,000 lb and a maximum service speed of 75 m.p.h. The one hour tractive effort (full field) is 28,700 lb at 29·5 m.p.h., while the continuous tractive effort (full field) is 28,200 lb at 30·4 m.p.h. The maximum rheostatic braking effort is 44,000 lb at 35 m.p.h.

The under-frame and superstructure are designed as an all welded, single unit, stress bearing structure. The drag-boxes are welded structures, heavily gusseted to withstand severe service. The sheet steel superstructure panelling is welded to the framing members. The roof sections carrying the pantographs are formed into a well and are removable to gain access to the control equipment. The three-axle bogies, which can be converted to 4ft 8½in gauge, are non-articulated. A nose suspended traction motor is mounted on each axle. The bogies are of the double swing bolster type fitted with drop type equalizing beams, while the axle box journals are fitted with roller bearings carried in cast steel housings. Four air brake cylinders are mounted on each bogie.

The control equipment provides for series grouping of the traction motors (six in series), series-parallel grouping (two parallel groups of three in series), and parallel grouping (three parallel groups of two in series).

Three stages of traction motor field weakening are provided. There are 42 power notches of which 21 are in series grouping, 12 in series-parallel grouping and 9 in parallel grouping. Three weak field running notches and a full field running notch, in which there is no resistance in circuit, are obtainable in each motor grouping. There are, therefore, a total of twelve running notches which may be used continuously. Rheostatic braking is obtained by separately exciting the traction motor fields and loading the armatures by current flow through resistors.

The driving position in each cab includes a master controller, air brake and sanding valves and push-button switches for the remote control of pantograph operating valves and the resetting of tripping relays. The instrument panel includes a speedometer, one motoring ammeter for each pair of traction motors, braking ammeter and duplex air pressure gauges. The instrument panel is provided with rear illumination for night driving. Lamps are mounted on the panel to indicate fault conditions in the operation of the traction motors, traction motor blowers and resistance blowers, also the availability of control circuit supply at the appropriate voltage.

Other cab mounted equipment includes the low voltage circuit breakers and switches for the control and protection of lighting circuits, also the recording apparatus for the speedometer. Each cab is provided with two 500 W low voltage convection heaters and a hotplate for food warming.

The control equipment for h.v. apparatus is housed in three control frames mounted in the locomotive superstructure. The entry doors to the equipment compartments are interlocked with the air supply to the pantograph, so that entry is possible only with the pantograph lowered and the equipment thereby disconnected from the supply.

The resistors, which serve during both motoring and rheostatic braking operation, are housed in two heat-insulated compartments in the centre of the locomotive superstructure. The resistors are provided with forced ventilation, each resistor compartment being ventilated by three fans which blow air over the resistors and expel it through louvred openings in the locomotive roof. The use of forced ventilation results in a compact and light resistor arrangement. Each locomotive is fitted with a three-machine motor generator set comprising a driving motor, constant voltage auxiliary generator and variable voltage exciter.

The self-excited auxiliary generator supplies current at 115 V for operating the control equipment, lighting circuits and auxiliary services. The separately excited variable voltage machine of the motor generator set provides field excitation for the traction motors during rheostatic braking. The 1,500 V driving motor of the three-machine motor generator set obtains its supply from the pantograph via isolating switches and is controlled by a hand operated separator.

Forced ventilation for the traction motors is provided by two motor driven blowers, one being housed in either nose-end compartment. Compressed air for the operation of locomotive and train brakes, sanding valves, pantographs, electro-pneumatic control gear, etc., is provided by two compressors whose 1,500 V motors receive their supply from the pantograph through isolating switches and a hand operated circuit breaker. Two locomotives coupled and with control wires interconnected may be operated from any driving cab under the control of one driver.

An Atomic Battery

ACCORDING to reports from America a tiny atomic battery in which the beta particles emitted by a by-product of the atomic pile are harnessed to a transistor to produce electricity has been developed by the Radio Corporation of America. Although at present the capacity is only about one-millionth of a watt it is said to yield "usable electric power a hundred times more efficiently than any previously reported radioactive generator."

A novel feature is the use of a silicone transistor which captures the beta particles thrown off by the strontium and so amplifies the electric current. This is brought about by gaps in the cloud of electrons in each silicone atom attracting electron particles.

The present battery is stated to utilize a radioactive source of only half a milligram of strontium 90. Amplification can be greatly increased by the use of secondary amplifiers.

Financial Section

STOCKS and SHARES

HAVING risen to within a hand's breadth of an all-time record, the indices to industrial share prices have now taken a decided step backwards. Leading the retreat were, inevitably, the previous favourites, which included many of the best-known names in the industrial market. Some of these came back sharply from their recent best quotations. Selling did not appear to be alarmingly heavy and at the beginning of this week, at any rate, the movement had not acquired proportions larger than might be associated with a natural reaction. By way of contrast, the gilt-edged market remained very steady.

Pause in Industrials

Nothing very tangible transpired to account for the setback in industrial share prices. Possibly the drift of the Chancellor's remarks in dealing with purchase-tax problems was taken as discouraging to previously extravagant hopes of tax concessions in the coming Budget. In addition, the increase in railway freight charges served to revive anxiety about the level of industrial production costs in this country, and, consequently, about the prospects for exports and the balance of trade. Uncertainties of this nature have, however, been in existence for some time without previously distracting serious attention from the brighter side of the medal. More probably the explanation was a normal bout of profit-taking after a long sustained rise in prices, which are now admittedly discounting, fairly heavily, the expectation of generally good company results over the next month or two.

Extent of the Rise

A comparison between industrial share prices at their recent best and those ruling at the beginning of the year leaves no doubt about the vigour of the advance in that comparatively short space of time. Rises of about 5s in the prices of General Electrics and British Insulated Callender's have been fairly representative of the performance of many industrials in the "blue-chip" class. There have been plenty of examples of bigger gains, as for instance in Parsons, Reyrolle and Westinghouse Brake, all of them six or seven shillings to the good in a matter of as many weeks. In specially favoured situations there have been numbers of equally good features. Gains during the same period of the order of 6s in Plessey and J. Lucas, of 8s in Radio Rentals and of 20 points in Cable & Wireless have been by no means rare occurrences, and make it easy to understand a pause for consolidation in the industrial market.

Electrical Equipment

The most favoured of the electrical equipment market shares have held their ground more firmly than was the case in several other groups. On the basis of the official quotations given in the accompanying price lists, only a few of the market leaders show any significant change from last week's

Week's Price Changes

Company or Board	Nom. Value	Middle price 15th Feb.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1953 Highest	1953 Lowest
Gilt-edged Stocks						£ s d		
Brit. Elec. 1968/73	100	90⅛		3	3	3 6 3	90	83 11/16
Brit. Elec. 1974/77	100	88¼xd		3	3	3 8 2	89	82
Brit. Elec. 1976/79	100	95		3⅛	3⅛	3 18 8	94⅛	88⅛
Brit. Elec. 1974/79	100	105		4¼	4¼	4 1 0	104	99⅛
Overseas Electric Supply								
Calcutta Elec.	£1	19/-		6†	6†	6 6 4†	21/-	18/-
East African Power	£1	21/6		7	7	6 10 3	25/-	20/9
Nigerian Elec.	£1	24/6		10	10	8 3 4	25/-	21/6
Palestine Elec. "A"	£1	18/9	+1/3	Nil	Nil	Nil	19/3	7/7
Perak Hydro-Elec.	£1	14/9	−6d	Nil	6	8 2 9	17/10	13/6
Equipment and Manufacturing								
Aberdare Cables	5/-	8/6		20	20	7 7 0*	8/9	7/4
Aerialite	1/-	11/6	−3d	88⅛	88⅛	7 13 9	11/6	8/1
Allen, W .H.	£1	51/3		15	15	5 17 0	51/-	42/10
Aron Elec. Ord.	£1	43/9		15	20	9 2 9	47/6	36/3
Assoc. Elec. Ord.	£1	45/6		20	20	4 8 0*	45/7	36/4
Automatic Tel. & El.	£1	66/3	−1/3	15	15	4 10 6	65/3	55/-
Babcock & Wilcox	£1	50/-	+1/3	18	18	—	50/-	40/4
Baldwin, H. J.	2/-	5/3		20	20	7 12 6	4/1	3/-
Bakelite	10/-	27/-	+9d	—	12½	4 12 7	24/9	16/-
British Aluminium	£1	37/6	+1/-	12	12	6 8 0	43/10	35/-
B.I. Callender's	£1	42/-	−6d	9	10	4 15 3	40/10	33/3
B.I. Callender's 6% Pref.	£1	25/6		6	6	4 14 10	26/3	23/-
British Thermostat	5/-	21/3		30	35	—	19/-	14/-
British Vac. Cleaner	5/-	14/9	+1/-	25	25	8 9 6	16/6	11/-
Brook Motors	10/-	31/6		20	20*	6 7 0	37/-	27/10
Brush Ord.	5/-	5/-		10	4	—	5/4	2/11
Bulgin, A. F.	1/-	3/3		30	30	9 4 6	3/5	2/6
Burco	5/-	13/-	+3d	35	35	6 14 8*	12/2	8/6
Chloride El. Storage	£1	48/9		15	20	4 2 0*	44/10	32/3
Clarke Chapman	£1	72/6		15	17½	4 16 6	70/6	57/6
Cole, E. K.	5/-	24/-		25	25*	5 4 3	23/9	14/2
Cossor, A. C.	5/-	8/6		10	10	5 17 9	11/4	6/4
Crabtree	10/-	27/6	+6d	17½	17½	6 7 3	32/6	23/9
Crompton Parkinson Ord.	5/-	15/-		11¼	20	6 13 4	16/-	8/7
De La Rue	5/-	12/9	−3d	35	Nil	Nil	14/6	6/3
Decca	5/-	37/-xd		150	35*	4 14 7	37/9	17/6
Desoutter	5/-	17/6	+9d	16	18	5 2 10	17/6	14/3
Dewhurst	2/-	6/-		19	19	6 6 8	6/9	5/-
Dictograph Tel.	2/-	5/4½		20	20*	7 9 0	5/10	3/10
Dubilier Condenser	1/-	4/9		28	25*	5 5 3	4/4	2/10
E.M.I.	10/-	13/6	−6d	12	8	5 18 6	15/3	11/6
Electrical Components	5/-	12/-xd		20	20	8 6 8	12/-	9/3
Elec. Construction	£1	57/-	+2/-	15	15	5 5 3	56/-	50/6
Enfield Cable Ord.	£1	21/-	+1/-	7½	5	4 15 3	24/10	17/-
English Electric	£1	42/6		15	15	—	40/8	34/-
English Electric 3½% Pref.	£1	16/-		3½	3½	4 13 9	16/4	14/6
Ericsson Tel.	5/-	49/-	+3d	22†	22†*	2 4 9†	48/9	36/-
Ever Ready	5/-	27/3	+9d	35	35	6 8 5	29/-	25/-
Falk Stadelmann	£1	38/3		15	15	7 16 10	44/3	38/3
G.E.C. Ord.	£1	41/3		22½	11½*	5 9 0	46/-	36/3
G.E.C. 6⅛% Pref.	£1	27/-		6⅛	6⅛	4 16 3	27/7	24/9
General Cables	5/-	16/9		30	30	8 19 2	17/-	14/9
Greenwood & Batley	£1	42/-		15	17½	8 6 9	41/6	38/-
Hackbridge Cable	5/-	12/-	+3d	20	20	8 6 8	13/-	10/4
Hackbridge & Hewittic	5/-	17/6	+6d	20	20	5 14 3	18/3	16/1
Hall Tel. Acc.	10/-	11/-	−6d	10	10	8 14 0	12/7	8/6
Heatrae	2/-	4/-		12½	12½	6 5 0	4/3	3/3
Henley's	10/-	16/6	−3d	20	10½*	6 7 3	19/4	16/-
Holophane	5/-	13/9		20	20	7 5 6	13/9	11/1

* After capital bonus. † Free of income tax.

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.

figures. Some of the quotations may be a little flattering by reference to the prices at which shares have actually been changing hands. In no case, however, did the reaction, at least in its early stages, amount to much in comparison with the extent of previous rises. In several instances shares made further headway, notably J. Lucas, with a jump of 3s 6d, and R. A. Lister, which put on 3s in response to reports of a large contract. Others to move against the tide included Siemens, Sturtevant, Bakelite, Electric Construction and Vactric.

in Electrical Investments

Company or Board	Nom. Value	Middle price 15th Feb.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield % £ s d	1953 Highest	1953 Lowest
Equipment and Manufacturing—continued.								
Hoover	5/-	28/3	+6d	35	25	4 8 6	26/10	20/3
I.C.I.	£1	56/6	+3d	13	13	4 12 0	54/-	41/6
Intl. Combustion	5/-	15/-		25	15*	5 0 0	15/6	12/1
Johnson & Phillips	£1	50/6		15	15	5 18 3	59/3	49/-
Lancashire Dynamo	£1	45/-		12½	12½	5 11 0	47/-	41/-
Laurence, Scott	5/-	15/3		15	15	4 18 3	14/6	11/9
Lister, R. A.	£1	35/-	+3/-	9	9	5 2 9	34/3	27/9
London Elec. Wire	£1	42/-	+9d	12½	15	3 11 5*	38/3	26/-
J. Lucas	£1	57/-	+3/6d	9⅛	10⅝	3 16 0	51/3	35/6
Marryat & Scott	2/-	5/3		22½	22½	8 11 6	6/3	5/1
Mather & Platt	£1	54/-		12½	15	5 11 0	53/10	41/3
Metal Industries	£1	33/6	−6/6	15	12*	—	47/9	37/9
Midland Elec. Mfg.	£1	65/-	+1/3	15	15	4 12 4	63/9	56/3
Morphy Richards	4/-	19/-		40	40	8 8 6	16/3	13/-
Murex	£1	53/6	+6d	15	15	5 12 0	60/9	50/6
Newman Ind.	2/-	2/4½		10	10	8 8 6	2/10	2/-
Oldham & Son	1/-	2/9		35	17½*	6 7 3	2/10	2/2
Parnall (Yate)	5/-	5/-	+3d	6	6	6 0 0	4/9	2/6
Parsons, C. A.	£1	45/-	+1/9	10*	12½	—	48/-	27/9
Plessey	5/-	44/3	+9d	25	30	3 7 10	37/-	20/1
Pye Deferred	5/-	19/6	−3d	18	20	—	16/3	10/6
Revo	10/-	17/9		27½	27½	—	17/6	13/11
Reyrolle	£1	72/6		10*	12½	—	79/-	51/-
Rheostatic	4/-	11/3		16½	19	6 15 0	12/-	8/-
Richardsons Westgarth	5/-	10/-		12	15	7 10 0	11/1	8/6
Scottish Cable	4/-	13/9	+3d	32	20*	5 16 3	13/3	11/1
Siemens Ord.	£1	38/3	+1/3	10	10	5 4 7	37/-	31/6
S. Smith (England)	4/-	14/-	+6d	12½	15	4 5 9	12/6	7/11
Southern Areas	£1	18/-		5	6	6 13 4	19/7	10/3
Strand Elec.	5/-	8/9		17½	17½	10 0 0	10/-	7/9
Sturtevant	5/-	34/-	+1/6	17½†	18·1†*	—	29/9	20/10
Sun Elec.	£1	25/-		15	15	12 0 0	27/-	24/6
Switchgear & Cowans	5/-	12/6		22½	22½	9 0 0	16/9	12/6
Taylor, T.	5/-	12/3		20	25	5 2 0*	12/3	9/6
T.C.C.	10/-	43/9		20	20*	—	42/6	31/5
T.C. & M.	£1	33/6	−6d	10	8½*	5 1 6	31/6	25/6
Telephone Mfg.	5/-	8/6	+1/-	10	10	5 17 8	9/4	7/1
Thorn Elec.	5/-	16/6		12½	12½	3 15 9	14/-	7/10
Thornycroft	£1	36/3		15	15	8 5 6	54/-	29/9
Tube Investments	£1	68/6	+1/-	15*	15	4 7 8	71/9	54/-
Vactric	5/-	9/6	+6d	Nil	Nil	Nil	10/3	3/6
Veritys	5/-	7/-		7½	10	7 2 9	5/4	4/1
Wallsall Conduits	4/-	46/3		70	70*	6 4 6	47/6	43/9
Ward & Goldstone	5/-	43/9		45	45*	5 2 9	46/-	29/9
Watford	2/-	5/3	+3d	25	25	—	5/6	4/10
Westinghouse Brake	£1	68/9		14	15	4 7 3	64/-	51/3
West, Allen	5/-	14/-		15	15	5 7 3	14/4	10/3
Wolf Electric	5/-	13/6	+6d	—	15	5 11 0	12/8	9/6
Trusts, Transport and Communications								
Anglo-Am. Tel.:								
A Ord.	100	83½		—	6	7 3 9	91	77
Ord.	100	52½		—	3¾	7 2 10	57½	53
Anglo-Portuguese	£1	23/3	+6d	8	8	6 17 9	23/9	20/1
Brit. Elec. Traction:								
Def. Ord.	5/-	41/-	−3/-	25	35	4 5 4	39/6	21/3
Cable & Wireless:								
Ord.	100	165½xd		8	9	5 8 9	148	124
5% Loan	100	97½		4	4	4 2 1	97¾	93
Calcutta Trams	£1	19/-		6†	2½†	—	23/6	16/-
Cape Elec. Trams	£1	14/-		5½	5½	7 17 3	13/-	9/-
Marconi Marine	£1	28/9		10	10	6 19 2	31/6	26/9
Oriental Tel. Ord.	£1	80/-		16	16	—	75/-	59/-
Telephone Props.	£1	4¾		8	8	—	126/3	33/-
Telephone Rentals	5/-	9/6		10	10*	—	10/-	6/8

Early Borrowing Possible

Signs of a revival in the gilt-edged market draw attention to the fact that for most of the time, in the last month or two, this market has been a relatively static spectator of the lively performance in the industrial and mining sections of the House. Apart from a little speculative activity in advance of each Thursday's announcement of the Bank Rate, price movements have been restricted to small fractions. Lately the Treasury completed the last of a series of funding operations; an early resumption of borrowing, on the part of the Government and of the nationalized industries, is thought to be probable. The British Electricity Authority, which last came to the market nearly a year ago, has been suggested as likely to be among them.

British Electricity Stocks

The two senior 3 per cent British Electricity stocks, dated 1968/73 and 1974/77, stand now on a current yield basis of rather less than 3½ per cent. Quoted respectively at a little over and under 90, their main attraction for the ordinary investor is of course the capital profit of about 10 points which must accrue by the time they fall due for repayment at 100. Allowing for this, the so-called redemption yields work out at 3¾ per cent. In the case of the 4¼ per cent British Electricity stock 1974/79, quoted at 105, the present yield is 4·1 per cent, but here the holder must take account of the eventual loss of the 5 points premium at maturity, which brings down the redemption yield to a round 4 per cent. The 3½ per cent stock, redeemable 1976/79 and quoted at 94⅜, holds an intermediate position between the others, giving a current yield of nearly 3¾ per cent, or 3·9 per cent allowing for the redemption profit of about 5 points.

Dividend Restraint

This year's dividend prospects are by now generally agreed to have been a major factor in raising share prices during recent months. At the same time the tendency, already apparent, towards more liberality in board-room decisions has become a matter of political controversy, so that Mr. Butler's observations in Parliament last week came as a timely aid to keeping the matter in its right perspective. To correct any impression of profligacy in dividend policies, he showed that, on the basis of the capital employed in industrial companies, the shareholders' return has in fact been dropping steadily for several years, from 3·4 per cent in 1949 to 2·8 per cent in 1953. His definition of dividend restraint was a policy giving the shareholders a fair return, while retaining enough resources to cover future risks and development.

None of the recent electrical company declarations has gone near to overstepping these bounds. If past experience is anything to go by, those to come are equally unlikely to do so.

Miscellaneous Matters

Announcing a reduction in the current year's interim dividend from 4 to 3 per cent, Metal Industries warn ordinary stockholders to expect, also, a final distribution lower than last year's 8 per cent. Profits are stated by the company to have fallen substantially. The shares, at 33s 6d, are 6s 6d lower on the week. S. Smith & Sons will be holding meetings in this coming week to approve the capital bonus proposals. The 4s shares have put up one of the best performances in the industrial market during the past few months. Verity's 5s shares, the subject recently of " bid " rumours and of a statement from the company to the effect that no negotiations were in progress, held their advance in price to around 7s.

REPORTS and DIVIDENDS

The Palestine Electric Corporation, Ltd.—Following on the negotiations between the Corporation and the Government of Israel, an offer for the purchase of the issued ordinary and " A " ordinary stock and ordinary shares of the Corporation has been received at its office in Haifa, from the Israel Government. The text of the offer has not yet been received in London, but it is understood that it is to purchase the ordinary and " A " ordinary stock on the principal and London registers at 29s 6d per £1 stock unit, payable in fifteen equal half-yearly instalments, commencing 1st October next, with interest at 4 per cent per annum, as from that date on the amount outstanding, and to purchase the shares on the Israel register at $2·80 in Israel Government Tavei dollar bonds and I£1.400 for each share of £1 nominal value, the currency amount to be paid in six half-yearly instalments commencing 1st October next, with interest at 4 per cent per annum, as from that date on the amount outstanding. The offer will be circulated to the members as soon as possible after it is received in London.

The British Transport Commission.—The prospectus was published on Tuesday last and the lists opened and closed yesterday (Thursday), for an issue of £80,000,000 British Transport 4 per cent guaranteed stock, 1972–1977 at £101 per cent. Until 14th May it will be designated " A " stock; thereafter it will be amalgamated with the existing stock. After the present issue a total of £252,839,365 will have been borrowed, leaving borrowing powers still unused to the extent of £22,160,635.

J. & E. Hall, Ltd., report a trading profit for the year to 30th September last of £531,233, as compared with £545,462 for the preceding year, and after providing £266,000 for taxation, a net profit of £265,233 (against £237,462). A sum of £100,000 is provided for diminution in value of stock and work in progress, and it is proposed to pay a final dividend of 12½ per cent (against 10 per cent), making 15 per cent (12½ per cent). The balance carried forward is £426,069 (against £320,146 brought in).

Hilger & Watts, Ltd.—A net profit of £28,634 is shown for the year ended 30th September last, as compared with £28,347 for 1951–52. It is proposed to pay a dividend for the year of 7½ per cent (same), and to carry forward £73,408 (against £51,095 brought in).

Crabtree Electrical Industries, Ltd., has declared an interim dividend of 7½ per cent (unchanged).

George Cohen, Sons & Co., Ltd., have declared an interim dividend of 3½ per cent actual, less tax, on the ordinary stock.

The Direct Spanish Telegraph Co., Ltd., reports a net profit for 1953, after providing for taxation, of £4,555, as compared with £4,803 for 1952. The dividend for the year is unchanged at 4½ per cent.

New Companies

Page's of Barkingside, Ltd.—Registered 3rd February. Capital £500. Manufacturers of and dealers in electrical goods of all kinds, wireless and television sets, etc. Directors: D. F. W. Page and J. H. Fenn. Regd. office: 3, Broadway Parade, Fencepiece Road, Barkingside.

Jaylee Radio, Ltd.—Registered 4th February. Capital £100. Dealers in radio, television and electrical appliances of all kinds, etc. A. R. Hillier is the first director. Regd. office: 30, Lee High Road, Lewisham, S.E.13.

Lampitts (Wolverton), Ltd.—Registered 4th February. Capital £5,000. To acquire the business of electrical and radio engineers, contractors and suppliers carried on by M. J. Gunstone at Wolverton and Stony Stratford, Bucks. Directors: M. J. Gunstone and Doris J. Gunstone. Regd. office: 8, Stratford Road, Wolverton, Bucks.

John S. Hall, Ltd.—Registered 3rd February. Capital £1,000. Refrigeration, mechanical, electrical and radio engineers, etc. Directors: J. S. Hall and Mrs. Hilda Hall. Regd. office: 81–3, Cliff Road, Canal Street, Nottingham.

A.G.M. Electric Wholesale, Ltd.—Registered 25th January. Capital £5,000. Directors: A. G. Mead, F. L. Holt, and J. W. Bucknell. Regd. office: 35, Hartington Road, W. Ealing, W.13.

Vigus & Co., Ltd.—Registered 5th February. Capital £10,000. To acquire the business of retail radio and electrical dealers and repairers now carried on by A. S. Vigus, A. W. E. Vigus, R. F. Codling and S. H. Vigus, at 413, Sydenham Road, West Croydon; 167, Mitcham Road, Tooting; 43, Anerley Road, Croydon; 40, Grove Vale, Dulwich, and 113, Bellingden Road, Peckham, as Gem Radio & Electrical Services. Directors: A. S. Vigus, R. F. Codling, A. W. E. Vigus and S. H. Vigus. Solicitors: Rayner & Co., 119, Moorgate, E.C.2.

Woodward Brothers (Kidlington), Ltd. Registered 10th February. Capital £5,000. Electricians, radio and electrical engineers, experts and contractors, etc. Directors: H. C. Woodward and B. L. Woodward. Regd. office: 21, Exeter Road, Kidlington, Oxford.

Increases of Capital

Taylor Tunnicliff (Electrical Industries), Ltd.—Increased by £300,000, in 1,200,000 ordinary shares of 5s, beyond the registered capital of £500,000.

Fleet Electrics, Ltd.—Increased by £15,000, in £1 5½ per cent redeemable preference shares, beyond the registered capital of £45,000.

Lighting, Heating & Traction Supplies Co., Ltd.—Increased by £10,000, in £1 ordinary shares, beyond the registered capital of £5,000.

Liquidations

Wilson & Green (Television), Ltd.—In voluntary liquidation. Meetings of creditors and members on 30th March at the offices of A. C. Palmer & Co., Court Chambers, Friar Lane, Leicester, for the purposes provided for in section 300 of the Companies Act, 1948.

Electrical Power Specialists (Hendon), Ltd.—Winding up voluntarily. Liquidator, Mr. A. W. Hunter, Latham & Co., Walter House, 418–422, Strand, London, W.C.2, appointed 29th January.

Bankruptcies

R. D. Nichols, 9, Friary Street, Plymouth, trading as " The Eagle Electrical Engineering Co.," electrical engineer. Trustee, Mr. F. B. Goodman, 24, Lockyer Street, Plymouth, Official Receiver, released 9th February, 1954.

H. J. O. Evans, High Street, Harlech, Merioneth, plumber and electrical engineer.—Trustee, Mr. E. S. Browne, 41, North John Street, Liverpool, 2, released 22nd January, 1954.

C. W. Wainwright, residing at 10, Victoria Row, Pudsey, Yorks, electrical engineer, formerly carrying on business at 111, Gelderd Road, Holbeck, Leeds, under the style of " C. Cliff & Co.", electrical engineers; at 68, Domestic Street, Holbeck, in partnership, under the style of " Speedwell Electric Co.", electrical engineers; at Lower Wortley Road, Lower Wortley, Leeds, and at Westfield Road, Burley, Leeds, in partnership, under the style of " Smith's Cleaners " and " Express Cleaners ", dry cleaners; at New York Road, Leeds, under the style of " Cliff-Jackson & Co.", electrical, radio and television engineers; at Lower Wortley Road, Lower Wortley, Leeds, under the style of " Renew Radio ", as radio engineers; at 96, Dixon Lane, Leeds, in partnership under the style of " E. Murray & Co.", electrical engineers; at 10, Victoria Row, Pudsey, and Hough Side Road, Pudsey, under the style of " Wainwright & Bailey," motor dealers.—Public examination 6th April at the County Court House, Manor Row, Bradford.

NEXT WEEK'S EVENTS

Organizers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 221, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged

Monday, 22nd February

BIRMINGHAM.—James Watt Institute, Great Charles Street, 6 p.m. I.E.E. South Midland Radio Group. "What is an Amplifier?" by Dr. D. A. Bell.

BRISTOL.—Electricity House, Colston Avenue, 7 p.m. I.E.E. Western Utilization Group. "The Application to Industry of Radioactive Isotopes," by J. L. Putman.

DUBLIN.—Gresham Hotel, 9 p.m. I.E.E. Irish Branch. Annual conversazione and dance.

GLASGOW.—39, Elmbank Crescent, 7.15 p.m. Institution of Works Managers, Glasgow Branch. "Steam Utilization and Fuel Efficiency," by J. Edward.

LEICESTER.—E.M.E.B., Charles Street, 7.30 p.m. I.E.S. Leicester Centre. "Light, Colour and the Stage," by A. G. H. Tuxford.

LONDON.—Savoy Place, 5.30 p.m. I.E.E. Radio Section. Discussion on "Acceptable Standards of Quality in Sound Broadcast Transmission and Reception," opened by J. K. Webb.

NEWCASTLE-UPON-TYNE. — Neville Hall, Westgate Road, 6.15 p.m. I.E.E. North-Eastern Centre. "The Co-ordination of Insulation of High-Voltage Electrical Installations," by J. S. Cliff.

Tuesday, 23rd February

BIRMINGHAM.—Imperial Hotel, 6.30 p.m. Engineers' Guild, West Midland Branch. "The Impact of Information on Industry," by K. J. Ryder.

COVENTRY.—Coventry Electric Club. "Clocks Ancient and Modern," by A. W. Marshall.

LEEDS.—1, Whitehall Road, 6.30 p.m. I.E.E. North Midland Students' Section. Students' lecture. "Electrical Safety Precautions," by H. W. Swann.

LONDON.—Savoy Place, 5.30 p.m. I.E.E. Measurements and Supply Sections. "Some Applications of the Electrolytic Tank to Engineering Design Problems," by H. Diggle and E. R. Hartill.

MANCHESTER. — Engineers' Club, Albert Square, 6.15 p.m. I.E.E. North-Western Measurements Group. Discussion on "The Influence of Legislation on the Costs of Metering," opened by S. Howarth.

WOLVERHAMPTON.—Wolverhampton & Staffordshire Technical College, Wulfruna Street, 7.15 p.m. British Institution of Radio Engineers, West Midlands Section. Paper by J. McFarlane.

Star and Garter Royal Hotel, 7 p.m. Institution of Works Managers, Wolverhampton Branch. "Industrial Law—Legal Aspects of Factory and Production Management," by H. P. Jost.

Tuesday, 23rd February, to Friday, 26th February

LEEDS.—Fenton Street Drill Hall. Business Efficiency Exhibition.

Wednesday, 24th February

FARNBOROUGH.—R.A.E. Technical College, 7.30 p.m. I.E.E. Southern Centre. "Technical Arrangements for the Sound and Television Broadcasts of the Coronation Ceremonies on 2nd June, 1953," by W. S. Procter, M. J. L. Pulling and F. Williams.

GLASGOW.—St. Enoch Hotel, 7.30 p.m. Institution of Engineering Inspection, West of Scotland Branch. "The Magic of Television."

39, Elmbank Crescent, 7.30 p.m. Institute of Marine Engineers, Scottish Section. Annual general meeting, followed at 7.45 p.m. by "The Application of Oxygen Using Processes in Engineering," by R. E. Dore.

LONDON.—Savoy Place, 5.30 p.m. I.E.E. Supply Section. "The Transport, Preparation and Utilization of Colliery Tailings at the Emile Huchet Power Station," by Prof. R. Gibrat and F. Chenin. (Joint meeting with the British Section of the Société Ingénieurs Civils de France.)

Waterloo Bridge House, S.E.1, 5 p.m. Institution of Post Office Electrical Engineers, London Centre. Informal meeting, "Post-War Developments in Call-Office Equipment," by R. T. A. Dennison.

At the Royal Institution, Albemarle Street, 7 p.m. Television Society. Fleming Memorial Lecture: "Colour Television" (Part 2), by G. G. Gouriet.

35, Grosvenor Place, S.W.1, 11.30 a.m. Electrical Association for Women, London Branch. Annual general meeting, followed by luncheon at Forum Club, Belgrave Square, 1 for 1.15 p.m. "Occasions Brave and Gay," by Dame Caroline Haslett.

MANCHESTER.—I.E.E. North Midland Students' Section. Visit to W. T. Glover's Cable Works, at 1.45 p.m.

MIDDLESBROUGH.—Cleveland Scientific and Technical Institute, Corporation Road, 6.30 p.m. I.E.E. North Eastern Students' Tees-Side meeting. "Impulse Testing," by M. Todd.

Wednesday, 24th February, to Friday, 5th March

GLASGOW.—McLellan Galleries. Scottish Handicraft and Homecrafts Exhibition.

Thursday, 25th February

HULL.—Y.E.B. Ferensway, 7.15 p.m. I.E.E. North Midland Centre. "Ignition Interference with Television Reception," by A. H. Ball and W. Nethercot.

LEEDS.—Hotel Metropole, King Street, 7 p.m. Leeds Association of Engineers. "Gas Turbines," by H. N. G. Allen.

LONDON.—Grosvenor House, Park Lane, W.1, 7 for 7.30 p.m. Institution of Electrical Engineers. Annual dinner.

Wandsworth Technical College, East Hill, S.W.18, 7 p.m. Institute of Welding, South London Branch. "The Influence of Arc Welding on Modern Engineering Design," by K. K. Doherty.

SHEFFIELD.—Grand Hotel, 7.30 p.m. Incorporated Plant Engineers, Sheffield & District Branch. "Training of Maintenance Personnel," by C. King.

SPALDING.—Swan Street Hall, 7.30 p.m. I.E.E. East Midland Centre, district meeting. "Overhead Lines."

Friday, 26th February

BATH.—S.W.E.B. Old Bridge Street, 7 p.m. I.E.S. Bath & Bristol Centre. "Black Light—its Effect and Applications," by R. V. Mills.

BIRMINGHAM.—Regent House, St. Philip's Place, Colmore Row, 6 p.m. I.E.S. Birmingham Centre. Annual general meeting. "Illumination from the Ophthalmic Standpoint," by W. J. Wellwood Ferguson.

COLCHESTER.—Red Lion Hotel, 6.45 for 7.30 p.m. Ipswich and District Electrical Association. Ladies' night, dinner and dance.

EDINBURGH.—Incorporated Plant Engineers, Edinburgh Branch. Annual dinner.

LONDON.—Storey's Gate, St. James's Park, S.W.1, 5.30 p.m. Institution of Mechanical Engineers. Clayton Lecture, "Atomic Energy Reactors," by Sir Christopher Hinton.

NEWCASTLE-UPON-TYNE.—King's College, 6.30 p.m. I.E.E. North Eastern Students' Section, Tyneside meeting. "Arc Control in High Voltage Air-Break Circuit Breakers," by D. Legg.

Royal Turk's Head Hotel. North East Electrical Club. Ladies' night.

TRADE MARK APPLICATIONS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 27th February:—

GAB (design). No. B716,787, Class 9. Scientific and electrical apparatus and instruments included in Class 9; photographic, cinematographic, optical, measuring and signalling apparatus and instruments; and parts included in Class 9 for all these goods.—Gerätebau-Anstalt, Balzers, Liechtenstein. Address for service, c/o Frank B. Dehn & Co., Kingsway House, 103, Kingsway, W.C.2.

IRONCLAD. No. B720,065, Class 9. Electric accumulators for export.—Chloride Electrical Storage Co., Ltd., Exide Works, Clifton Junction, near Manchester.

DRALOPERM. No. 720,429, Class 9. Metallic cores for electric inductance coils.—Steatit-Magnesia Aktiengesellschaft, Lauf-Pegnitz, Germany. Address for service, c/o Gill, Jennings & Every, 51–52, Chancery Lane, London, W.C.2.

PERMIONIC. No. 721,166; PERMAPLEX. No. 721,168, Class 9. Electrolytic cells and diaphragms for use therein.—Permutit Co., Ltd., Permutit House, Gunnersbury Avenue, London, W.4.

QUEENSWAY. No. B723,894, Class 9. Electric kettles.—Dependable Products, Ltd., Factory G.97, Queensway, Team Valley Trading Estate, Gateshead, 11.

TALKAFORM. No. 723,927, Class 9. Sound recording and sound reproducing apparatus and instruments, all being electrically operated; parts included in Class 9 of all the aforesaid goods; and wires, tapes, films, bands and sheets, all for use as sound recording media.—Ateliers de Constructions Electriques de Charleroi, Brussels, Belgium.—Address for service, c/o Feeny & Feeny, 2a, Charlwood Place, Westminster, London, S.W.1.

TELYTRAN. No. 724,104, Class 9. Telemetric instruments; and electrical apparatus for producing and transmitting direct current proportional to the electrical power input measured by such telemetric instruments.—Measurement, Ltd., Terminal House, Grosvenor Gardens, London, S.W.1.

EXELVICK. No. 725,139. CASTIVICK. No. 725,142. DURAVICK. No. 725,143. CORVICK. No. 725,144. MOLVICK. No. 725,145. All class 9. Electric arc welding apparatus, electric welding electrodes and holders therefor.—Metropolitan-Vickers Electrical Co., Ltd., St. Paul's Corner, 1–3, St. Paul's Churchyard, London, E.C.4.

MAXCESS. No. 724,120, Class 11. Fans, fan casings, ventilators and parts included in Class 11 of all these goods.—Woods of Colchester, Ltd., Braiswick Works, Colchester.

FLYEX. No. 724,435, Class 11. Electric lamps.—Lindner G.m.b.H., Bamberg, Bavaria, Germany. Address for service, c/o Chatwin & Co., 253, Gray's Inn Road, London, W.C.1.

No. 723,798 (design), Class 17. Electrical insulating materials.—Langley London, Ltd., 72, Borough High Street, London, S.E.1.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s 8d each including postage) will be obtainable after 31st March from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1949

8914. Philips Electrical, Ltd.—Sawtooth generators and polar position indicators embodying sawtooth generators. 1st April, 1949. (706313.)

23242. Wolseley Sheep Shearing Machine Co., Ltd., and Macnamara, H. J.—Electrical impulse mechanism for use in electrifying fencing. 7th December, 1950. Cognate applications 29025, 12th November, 1949, and 29026, 12th November, 1949. (706316.)

30536. Electropol, Ltd.—Electrolytic polishing of metals. 27th February, 1951. (706473.)

1950

2932. Spooner, W. W.—Fans. 27th December, 1950. (706474.)

4761. Boxfoldia, Ltd.—Carton for containing electric lamp bulbs and like fragile articles. 16th February, 1951. (706393.)

6843. Compagnie Industrielle des Téléphones.—Automatic switching system for telecommunications. 20th March, 1950. (706395.)

7215. Marconi's Wireless Telegraph Co., Ltd.—Transmission lines of the coaxial type for use on high frequencies. 29th January, 1951. (706397.)

10932. British Thomson-Houston Co., Ltd.—Gas turbine power plants. 3rd May, 1950. (706477.)

17060. British Insulated Callender's Cables, Ltd.—Means for controlling the tension in apparatus for lapping a strip of flexible material on to an electric conductor. 6th July, 1951. (706404.)

21032. Simplex Electric Co., Ltd.—Knobs and handles for control devices. 26th September, 1951. (706620.)

22663. Marconi's Wireless Telegraph Co. Ltd.—Ganged variable inductance devices. 8th June, 1951. (706479.)

23073. Crompton Parkinson, Ltd.—Circuits for electric discharge lamps and components therefor. 20th September, 1951. (706621.)

28179. Lumalampan Aktiebolag.—Electric lamps. 17th November, 1950. (706326.)

30446. British Thomson-Houston Co., Ltd.—Control of Ward-Leonard systems driving winding engines. 26th November, 1951. (706414.)

1951

1707. Firestone Tyre & Rubber Co., Ltd., and Collins, J. B.—Method and apparatus for producing a ripple free direct potential. 9th January, 1952. (706488.)

1984. Sylvania Electric Products, Inc.—Getter-flashing devices for electron-discharge tubes and the like. 25th January, 1951. (706489.)

1985. Sylvania Electric Products, Inc.—Filament tensioning means for electron-discharge devices. 25th January, 1951. (706490.)

4441. Sperry Corporation.—Electrical signal amplifying or converting apparatus. 23rd February, 1951. (706418.)

4660. Etablissements Merlin & Gerin.—Arrangements for electric distribution switchboards. 26th February, 1951. (706334.)

7219. Metropolitan-Vickers Electrical Co., Ltd.—Electric light fittings. 28th March, 1952. (706496.)

7330. Resistance Welders, Ltd.—Electric resistance welding machines. 17th March, 1952. (706337.)

7434. Metropolitan-Vickers Electrical Co., Ltd.—Electric light fittings. 28th March, 1952. (706497.)

8469. Siemens-Schuckertwerke Akt.-Ges.—Brushgear for three-phase commutator motors or the like. 11th April, 1951. (706339)

9211. Marconi's Wireless Telegraph Co., Ltd.—Electric servomotor control systems. 16th January, 1952. (706499.)

9796. Northrop Aircraft, Inc.—Glow-tube switch. 26th April, 1951. (706423.)

9853. Ferranti, Ltd.—Electrical apparatus for temperature measurement. 25th July, 1952. (706340.)

10214. Columbia Broadcasting System, Inc.—Television. 1st May, 1951. (706341.)

11315. British Thomson-Houston Co., Ltd.—Drive clutches for washing machines or the like. 15th May, 1951. (706500.)

11822. Burndept, Ltd.—Portable radio receivers. 1st April, 1952. (706630.)

11826. Metropolitan-Vickers Electrical Co., Ltd.—Production of welded joints in pipes and the like operating under stress at high temperatures. 17th April, 1952. (706631.)

13812. Northrop Aircraft, Inc.—Asymmetrical cold cathode flip-flop circuit. 11th June, 1951. (706430.)

13930. General Electric Co., Ltd., and Herwald, N.—Arrangements for automatically flashing electric lamps. 4th June, 1952. (706344.)

17750. Hoover, Ltd.—Electric hand irons. 26th July, 1951. Addition to 631054. (706433.)

18882. General Electric Co., Ltd., and Morris, G. G.—Electric transformers. 23rd July, 1952. (706641.)

19467. Siemens & Halske Akt.-Ges.—Method of and arrangement for the comparison of two light intensities. 17th August, 1951. (706355.)

19568. Schichau Akt.-Ges. F.—Photo-electric apparatus for reproduction of curves. 20th August, 1951. (706510.)

20204. Soc. d'Electronique et d'Automatisme.—Electric adding devices. 27th August, 1951. (706436.)

22682. Pye, Ltd.—Television cameras. 29th December, 1952. (706359.)

22782. Minister of Supply.—Radio or radar antennæ. 29th September, 1952. (706578.)

23860. Standard Telephones & Cables, Ltd.—Electric rectifying devices. 3rd October, 1952. (706514.) 23861. Electric counting devices and circuits employing semi-conductors. 3rd October, 1952. (706515.) 23862. Oscillators, particularly for radio receiving circuits, employing semi-conductor devices. 3rd October, 1952. (706516.)

23937. Strong, C. L.—Electro-therapeutic apparatus. 19th September, 1952. (706439.)

26834. Magnasca, Ltd., and Hansen, F.—Method of obtaining chain nuclear reactions releasing atomic energy. 15th November, 1951. (706518.)

27075. Beckman Instruments, Inc.—Electro-chemical apparatus. 19th November, 1951. (706519.)

27126. Siemens-Schuckertwerke Akt.-Ges.—Processes for the production of metal sheaths for electrical cables. 19th November, 1951. (706649.)

28807. Minister of Supply.—Waveguides. 8th December, 1951. (706367.)

28992. British Thomson-Houston Co., Ltd.—Lamp base printing mechanism. 11th December, 1951. (706449.)

29347. Standard Telephones & Cables, Ltd.—Thermistor circuits for thermometry. 14th December, 1951. (706368.)

30375. Clements, P. B.—Electric hurdle. 25th April, 1952. (706451.)

1952

359. Bulgin & Co., Ltd., A. F.—Electrical signalling and indicating lamps. 18th November, 1952. (706592.)

1512. Glover & Co., Ltd., W. T.—Manufacture of insulated electric conductors. 16th January, 1953. (706371.)

5166. General Electric Co., Ltd., and Speed, R. F. B.—Multi-channel electric pulse modulation signalling systems. 13th February, 1953. (706597.)

6207. Geyer, F.—Rotary electric machine with liquid cooling. 10th March, 1952. (706660.)

7213. British Thomson-Houston Co., Ltd.—Glass tubulatures for feeding mercury. 20th March, 1952. (706662.)

7729/30. Westinghouse Electric International Co.—Control systems for d.c. motors. 26th March, 1952. (706455/6.)

8046. Soc. d'Electronique et d'Automatisme.—Electric adding and subtracting devices. 28th March, 1952. (706457.)

9582. Marconi's Wireless Telegraph Co., Ltd.—Automatic radio direction finders. 26th November, 1952. (706666.)

9702. British Thomson-Houston Co., Ltd. Household mixers. 17th April, 1952. (706377.) 9703. Beater ejectors for kitchen mixers. 17th April, 1952. (706532.)

9774. Electrolux, Ltd.—Absorption refrigerating apparatus of the inert gas type. 18th April, 1952. (706533.)

9804. Western Electric Co., Inc.—Apparatus for attaching groups of electrical terminals to wires. 18th April, 1952. (706458.)

12048. Electronic & X-ray Applications, Ltd., Tunnicliffe, E. A. J., and Way, R. F.—X-ray apparatus. 12th May, 1952. (706378.)

12305. British Thomson-Houston Co., Ltd.—Electric motor control systems. 15th May, 1952. (706379.)

12544. Bagh, A.—Distribution board for electric conductors. 17th May, 1952. (706534.)

15678. Soc. Anon. des Manufactures des Glaces et Produits Chimiques de St. Gobain, Chauny & Cirey.—Electric resistance heaters. 20th June, 1952. (706606.)

15917. Standard Telephones & Cables, Ltd.—Electric pulse code modulation systems of communication. 24th June, 1952. (706381.)

16088. Westinghouse Electric International Co.—Timing devices for use with X-rays and other penetrating radiations. 26th June, 1952. (706671.)

19067. Siemens-Schuckertwerke Akt.-Ges.—Rotors for small electric motors. 28th July, 1952. (706543.)

22809. Strong, C. L.—Electro-therapeutic apparatus. 12th September, 1952. Divided out of 706439. (706466.)

27627. Tinnerman Products, Inc.—Electric terminal connectors. 3rd November, 1952. (706677.)

28112. Mullard Radio Valve Co., Ltd.—X-ray tubes. 7th November, 1952. (706468.)

29585. Heinzmann, F.—Centrifugal switch. 24th November, 1952. Addition to 683668. (706469.)

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Armagh.—1st March. Electrical installation in intermediate school, Convent of the Sacred Heart. A. N. Irens, consulting engineer, Friends' Provident Building, Howard Street, Belfast.

Australia. — BRISBANE. — 17th March. State Electricity Commission of Queensland. One 120 kW alternator, complete with exciter. (E.S.B. 3304/54. Ten/8286.)*

21st April. Arc suppression coils for 66 kV system for the Capricornia Regional Electricity Board. (E.S.B. 3188/54. Ten/8274.)*

Basingstoke.—27th February. Park Prewett Group Hospital Management Committee. Electric lamps for six months. Group secretary.

Belfast.—1st March. Northern Ireland Housing Trust. Electrical installations in 48 dwellings, Keady, and 40 dwellings, Randalstown. Offices of the Trust, 12, Hope Street.

3rd March. Ministry of Commerce. Electrical installation at the Ministry's advance factory, Dungannon. 10th March. Electrical installation at Erne Clothing Co.'s factory, Enniskillen. Chichester House, Room 28, Chichester Street.

Berkshire. — 4th March. County Council. Street lighting equipment. (See this issue.)

Canada.—REGINA, SASKATCHEWAN.—30th March. Saskatchewan Power Corporation. One 30,000 kW steam turbo-alternator and exciters, three-stage regenerative feedwater heating plant, surface condensing plant and auxiliaries. (E.S.B. 1862/54. Ten/8301.)*

Coleraine.—5th March. Coleraine & Portrush Hospital Management Committee. Electrical installation at Coleraine Hospital. W. & M. Given, architects and engineers, 1, Waterside.

East Riding.—15th March. County Council. Installation of electrical services at proposed Brough County Secondary School. County architect, County Hall, Beverley.

Edinburgh. — North of Scotland Hydro-Electric Board. 33 kV overhead lines, 33 kV cables and reconstruction of 11 kV distribution lines between Fort William and Loch Ailort. (See this issue.)

Egypt. — CAIRO. — 22nd April. Mechanical and Electrical Department, Ministry of Public Works. H.v. transmission lines and switching stations for second extension of the North Delta electricity scheme. (E.S.B. 3534/54. Ten/8339.)*

Farnborough.—2nd March. U.D.C. Three sewage pumps with electric motors, starters, switchgear, etc., for new pumping station at Cove Works. Surveyor, Town Hall, Farnborough, Hants.

Formosa. — TAIPEI. — 9th March. Central Trust of China. Electrical plant and equipment. (E.S.B. 3547/54. Ten/8338.)*

Huntingdon.—8th March. County Education Committee. Electrical installations at Ramsey and St. Ives Secondary Modern Schools. County architect, County Buildings.

India. — DELHI. — 26th February. Director General of Supplies and Disposals. E.h.v. insulated cables. (E.S.B. 3464/54. Ten/8289.)*

BHAVNAGAR.—19th April. Godhra Electricity Co., Ltd. Indoor draw-out truck type 3·3 kV switchgear. (E.S.B. 3463/54. Ten/8281.)*

BANGALORE.—28th February. Government of Mysore Stores Purchase Committee. Underground cable and accessories. (E.S.B. 4113/54. Ten/8361.)*

Iran.—TEHERAN.—10th March. Procurement Office. Copper weld wire. (E.S.B. 3581/54. Ten/8334.)*

King's Lynn.—6th March. Borough Council. Electric lamps for one year. H. G. Ridler, borough surveyor, Clifton House, 17, Queen's Street.

London. — POPLAR. — 1st March. Borough Council. Electric lamps for one year. Town clerk, Town Hall, E.3.

Luxembourg.—10th April. Ministère de Transports et de l'Electricité. Turbines, etc., for Esch-sur-Sure hydro-electric scheme. (E.S.B. 1782/54. Ten/8335.)*

Manchester.—5th March. Corporation. Street lighting equipment. (See this issue.)

Merthyr Tydfil. — 27th February. Borough Council. Electrical goods for one year. Borough surveyor, Town Hall.

Rowley Regis.—1st March. Borough Council. Electricians' requisites for one year. R. Hegan, town clerk, Municipal Buildings, Old Hill, Staffs.

Southampton.—15th March. Corporation. Rewiring at Swaythling Secondary School. (See this issue.)

Southend-on-Sea. — 12th March. Corporation. Underground main and street lighting fittings at Connaught House, Rochford. (See this issue.)

Southern Rhodesia.—BULAWAYO.—17th March. Municipal Electricity Department. Time-interval meter and valve-maintained frequency fork. (E.S.B. 3437/54. Ten/8294.)*

SALISBURY.—5th March. Department of Post and Telegraph. 2,000 telephones. (E.S.B. 3627/54. Ten/8319.)*

Staffordshire.—1st March. Education Committee. Electrical repairs and installations at schools at Bilston, Darlaston, Wednesbury, Wednesfield and Willenhall. Divisional education officer, Education Offices, Walsall Street, Wednesbury.

Sunderland.—22nd February. Town Council. Electrical installation at junior technical school, Villiers Street. J. E. Lewis, borough engineer, 27, Fawcett Street.

United States. — SEATTLE. — 16th March. U.S. Army Corps of Engineers. Two 67,368 kVA a.c. generators and appurtenances for Chief Joseph Dam power station. (E.S.B. 3366/54. Ten/8283.)*

PORTLAND, ORE. — 24th February. Bonneville Power Administration. Capacitor rack equipment. (E.S.B. 3708/54. Ten/8328.)*

Uruguay. — MONTEVIDEO. — 16th March. Administracion General de los Usinas Electricas y los Telefonos del Estado. Materials and equipment for fifty transformer substations. (E.S.B. 2717/54. Ten/8284.)*

30th March. Administracion Nacional de Puertos. Three radar sets. (E.S.B. 3597/54. Ten/8302.)*

West Houghton. — 26th February. U.D.C. Electric lamps for one year. F. H. Walker, surveyor, Town Hall.

Weston-super-Mare.—27th February. Hospital Management Committee. Supply of electric lamps for 12 months from 31st March next. Lewis Bull, group secretary, Royal West of England Convalescent Hospital, Uphill Road.

ORDERS PLACED

Bradford.—City Council. Electrical installations in 120 houses, Thorpe Edge estate (£2,497).—W. E. Winteringham.

Plymouth.—City Council. Recommended. Laying of an electric cable for the River Tavy (Lopwell) scheme (£4,599).—Scottish Cables, Ltd.

Stoke-on-Trent.—Birmingham Regional Hospital Board. Rewiring at Chest Dispensary, Shelton (£4,205).—Girdlestone & Co.

Thurrock (Essex).—Street lighting installations.—Cohen Bros. (Electrical), Ltd.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Abergele.—School; Pochins (Manchester), Ltd., King Street, Middlewich, Ches.

Acton.—Factory, Acton Lane; Harold Wesley, Ltd., manufacturing stationers, 143, Acton Lane, N.W.10.

Aylesbury.—Houses (40), Gateshead site; borough surveyor.

Barrow-in-Furness.—Houses (107), Abbotsmead estate; J. N. Flitcroft, borough surveyor, Town Hall.

Bexhill.—Dairy and offices, High Street; Rice & Son, Ltd., builders, 3, Palace Place, Brighton.

* Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).

Birmingham.—Offices, shops, etc., corner of New Street and High Street; E. Turner, secretary, Birmingham Co-operative Society, Ltd., High Street, 4, and Ravenseft Properties, Ltd., 52, Charles Street, London, W.1.

Blyth (Northumberland). — Hotel, Brierley Road; P. L. Browne, Son & Harding, architects, Pearl Buildings, Northumberland Street, Newcastle-on-Tyne.

Bootle.—Branch library (£22,924); Frank Gatley, Ltd., Lydiate.

Bristol.—Printing works at Kingswood; Bennett Bros., Ltd., manufacturing stationers, 11, John Street.

Showrooms and offices for Prices (Tailors), Ltd.; Wm. Irwin & Co., Ltd., builders, 2, Burley Road, Leeds.

Burton-on-Trent.—Grammar school; H. Bailey Chapman, town clerk, Town Hall.

Cheltenham.—Development and research laboratory; Dowty Equipment, Ltd., Arle Court, Gloucester Road.

Chester.—Houses (28) at Christleton; T. C. R. Eaton, architect, 16, White Friars.

Chesterfield.—Offices, warehouse and canteen, Sheffield Road; Charles Mason & Co., wholesale grocers, New Beetwell Street.

Clay Cross.—Flats (£11,900), Pilsley Road estate, for U.D.C.; John Adlington, Ltd., Clay Cross, Derbyshire.

Darlington.—Houses (56); borough architect.

Daventry.—Works, Braunston Road; British Timken, Ltd., Northampton.

Houses (38); Bosworth & Wakeford, Ltd., Daventry.

Dukinfield.—Dwellings (36), Lodge Lane; F. Bradley, architect, 4, Wood Street, Bolton.

Eastbourne.—Flats (42), with restaurant, Compton Street; Onyx Property Investment Co., Ltd., Central House, Finsbury Square, E.C.2.

Factory, Brampton Road; Hotchkiss, Ltd., 41, Ashford Road.

Ely.—Girls' High School; R. D. Robson, architect, County Hall, March.

Eston (Yorkshire).—Houses (22), Passfield Crescent and Strauss Road, for U.D.C.; direct labour.

Exeter.—Factory; Redheugh Iron & Steel Co., Ltd., Gateshead.

Felling-on-Tyne. — Houses (124); housing architect, Council Offices.

Fyfield (Cambridge).—Additions to residential open-air school (£20,000); West Ham borough engineer, Town Hall, London, E.15.

Hyde.—Extensions to works, Meadow Avenue; Redferns Rubber Co., Ltd.

Ilford.—Development of Shakespeare estate for housing; borough engineer, Town Hall.

Ipswich.—Houses (110), Chantry estate; borough surveyor.

Jarrow-on-Tyne.—Factory additions for Freedman Brothers, furniture manufacturers, Springwell Road.

Improvements to Jarrow Civic Hall (£13,000); direct labour.

Leek.—Houses (98) for Coal Industries Housing Association; Selleck, Nicholls & Co., Ltd., builders, St. Austell.

Lincolnshire. — School at Whaplode for Holland (Lincs) County Council; county architect, Boston.

Liverpool.—Secondary modern schools at Arnot Street (£143,600) and Bankfield (£148,926); city engineer, Dale Street, 2.

College of domestic science (£70,230); H. Brookfield & Sons, Ltd., 23, Mayfield Road.

Extensions to Speke Secondary Modern Boys'and Secondary Modern Girls'Schools; Tysons (Contractors), Ltd., Dryden Street, Liverpool.

Motor-bus garage at Shaw Road, Speke (£162,307); Holland & Hannen and Cubitts, Ltd., Liverpool.

Llandudno.—Five shops and maisonnettes, Tre Creuddyn estate; U.D.C. surveyor.

London. — BROCKLEY.— Additional buildings for Samuel Pepys School (£140,000); C. P. Roberts & Co., Ltd., builders, 31, High Holborn, W.C.1.

LAMBETH.—Flats (301), Hartington Road; A. W. Kenyon, architect, 15, Adeline Place, W.C.1.

ISLINGTON.—Ten- and four-storey blocks of flats, Dame Street; town clerk, Islington Town Hall, Upper Street, N.1.

NORWOOD.—Factory extension, Beulah Hill; J. & C. Bowyer, Ltd., Haynes Lane, S.E.19.

Luton.—Experimental plant house; Laporte Chemicals, Ltd., Kingsway.

Shops with flats over, Ashcroft housing estate; borough engineer, Town Hall.

Macclesfield.—Shopping centre at Weston; J. H. Dossett, borough surveyor, Town Hall.

Manchester.—Houses (269), Langley estate, Middleton; A. Locke (1940) Ltd., Higher Road, Urmston.

Middlesbrough. — Houses (850), at Pallister Park; borough engineer.

Morecambe and Heysham.—Shops and flats on sites at Blackberry Hall and Trumacar; R. Rose, town clerk, Town Hall, Morecambe.

Morpeth.—Pumping station, Mitford waterworks; C. F. Lisle, water engineer, Town Hall, North Shields.

Nelson.—Works extensions; Fryer & Co., Ltd., Victory V Works, Chapel Street.

Newcastle-on-Tyne.—Primary school at Fawdon (£46,208); city architect, 18, Cloth Market.

Newcastle-under-Lyme. — Departmental store at Penkull Street, for Debenhams, Ltd.; Hulme & Upright, architects, District Bank Chambers, Tunstall, Stoke-on-Trent.

Oldham.—R.C. church at Hathershaw estate; H. Partington & Sons, 134, Featherstone Road North.

Portsmouth.—Works proposed on 10 acre site on the Leigh Park estate; International Chemical Co., Ltd., Braydon Road, Stamford Hill, London, N.16.

Radcliffe.—Houses (54), Outwood estate; borough surveyor.

Rainham (Essex).—Block of offices on New Road corner site; Phoenix Timber Co., Ltd., Frog Island, New Road.

Rotherham.—Houses (92), Sheepcote Road, etc.; Sir Osbert Sitwell, Estate Office, Renishaw, Eckington.

Runcorn.—Works canteen; Imperial Chemical Industries, Ltd., Rocksavage Works.

Scarborough.—Factory, Eastfield; D. Keeble & Sons, Ltd., Nottingham.

South Ockendon. — Occupational therapy buildings at hospital; W. J. Lewis & Sons, consulting architects, 68, Cranbrook Road, Ilford.

Stockport.—Further 81 dwellings at Bridge Hall estate; borough engineer.

Sturry.—Houses (28), Broad Oak, for Bridge-Blean R.D.C.; H. V. Godfrey, architect, 63, Oxford Street, Whitstable.

Twickenham.—Central depot, Craneford Way area; A. S. Knolles, borough surveyor, Municipal Offices.

Wallsend-on-Tyne.—Offices, stores and garage in Station Road, Walker; Beal & Son, Ltd., Wallsend, 6.

Extensions, grammar school; county architect, County Hall, Newcastle-on-Tyne.

Walthamstow.—Additions to factory; Duroglass, Ltd., scientific glass manufacturers, Blackhorse Lane, E.17.

Wellington (Salop).—Three sewage pumping stations and sewage disposal works, for R.D.C.; A. H. S. Waters, engineer, 25, Temple Row, Birmingham, 2.

Welwyn Garden City.—Houses (261), Thistle Grove area; Mauger & Partners, architects, Parkway Chambers.

West Bromwich. — Houses (32), Hateley estate; W. Kendrick & Sons, Ltd., Tasker Street, Walsall.

Wigan.—Houses (230), to be built this year; A. Royle, town clerk, Library Street.

Wisbech.—College of Further Education for Isle of Ely County Council (£73,080); Bettles Building Co., Ltd., Millfield, Peterborough.

Wrexham.—Community centres at Churchill Drive, Queen's Park, Oak Drive, Acton Park, and Holt Road; borough surveyor, 31, Chester Street.

Northern Rhodesia Trade

IN Northern Rhodesia's electrical imports in 1952 there was an increase in value of about two-thirds on the previous year. The advance ran through all groups, with the United Kingdom taking the leading share except in cable and wire, where the Union of South Africa was predominant. The chief lines with notes of increases and decreases (unimportant) between the two years are shown below.

Class of Goods	1952 £ (000)	Inc.or dec. on 1951 £ (000)
Lamp bulbs, electric	61	+ 14
From U.K. ..	34	—
„ *U.S.A.* ..	8	+ 3
„ *South Africa*	14	+ 6
Telegraph and telephone instruments and apparatus ..	322	+ 240
From U.K. ..	309	+ 230
Radio apparatus and parts	198	+ 58
From U.K. ..	143	+ 100
„ *South Africa*	22	— 3
„ *S. Rhodesia*	26	+ 8
Cable and wire ..	959	+ 479
From U.K. ..	470	+ 184
„ *South Africa*	474	+ 282
Batteries	131	+ 24
From U.K. ..	69	+ 20
„ *South Africa*	52	— 4
Other elec. machinery and material ..	1,687	+ 527
From U.K. ..	1,292	+ 336
„ *South Africa*	262	+ 117
„ *U.S.A.* ..	63	+ 27